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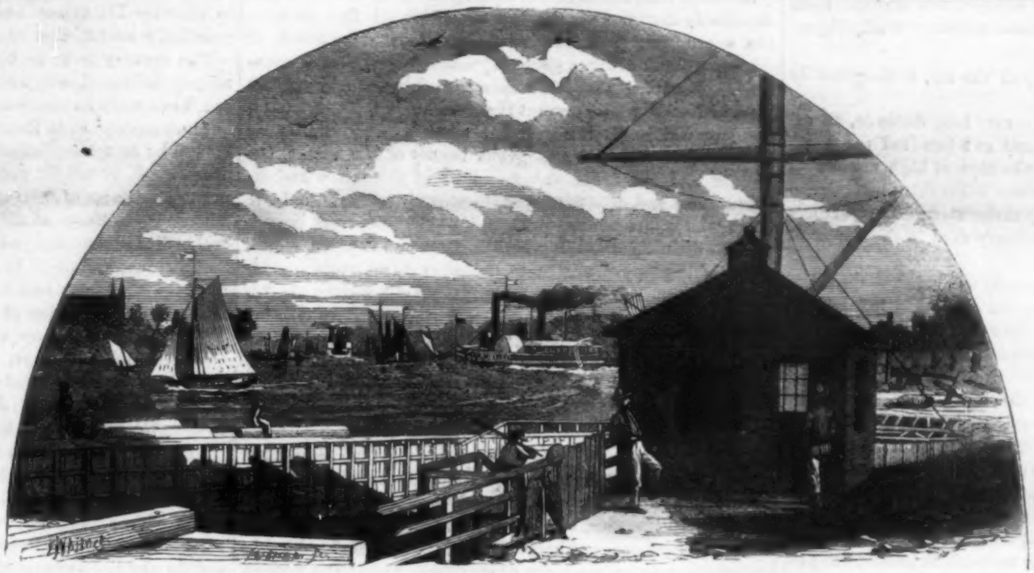
HELL GATE IMPROVEMENT.

During the last twelve months, the work of excavating the rock which forms the great obstruction to entering the East River by way of Long Island Sound has been progressing steadily, but very slowly, on account of an unwise delay on the part of Congress in furnishing the necessary funds. The interest on the money already expended on this important operation amounts to a large sum annually, and hindering the progress of the work, by only doling small sums in a niggardly and parsimonious manner, is surely unwise, and ultimately will be expensive. However, the carrying out of the work, under the able superintendence of General Newton, leaves little to be desired; and as public interest in the matter has been in no way diminished by the delay, a short description of the work will be acceptable to our readers.



VIEW OF HELL GATE FROM TOP OF COFFER DAM.

THE HELL GATE SUBMARINE OPERATIONS

The large central shaft, shown in our larger illustration, has been sunk at the extreme edge of Hallett's Point, the rocks of which are bare at low water. The hole is 32 feet deep, and is surrounded by a coffer dam, on the parapet of which persons are shown walking. From this shaft, ten headings or tunnels radiate, under the rock which it is proposed to remove, and these are connected by galleries, circular in form and concentric with the center of the shaft. From these headings and galleries, twenty-eight smaller headings have been driven, and altogether the immense area of twenty-two and a half acres have been undermined, a mile and a half of tunneling having been executed.

To perform this labor in safety, of course the superincumbent rock must be in no danger of falling; and to ascertain its thickness all over the area, soundings at a distance of one foot only from each other have been made all over the rock that is to be removed. Twenty-two thousand times has the lead been sunk in this work; and in places where shale was met with, the sounding instrument was driven through to the bed rock by boring.

The consumption of blasting materials has been very large. Nitro-glycerin has been much used, but latterly vulcan powder, made by mixing 30 parts nitro-glycerin with 70 parts gunpowder, has been employed. Explosives equivalent to 100,000 lbs. nitro-glycerin have already been consumed. For the final burst, which is to rend asunder all the columns and walls of rock between the tunnels, and let the roof fall, 40,000 lbs. nitro-glycerin, it is said, will be required.

It is expected that the work will be completed, and the channel open to vessels drawing 26 feet of water, by August 1, 1876.

Remarkable Effects of Arctic Cold on Man.

Lieutenant Payer, the Austrian arctic explorer, has been laying some of the results of his explorations before the Geographical Society of Vienna. Referring to the influence of extreme cold on the human organism, he related that on March 14, 1874, he and his companions made a sledge journey over the Semiklar glacier, in order to make observations of Francis Joseph Land. On that day the cold marked 58° Fah. below zero Notwithstanding this intense cold, M. Payer and a Tyrolese went out before sunrise to make observations and sketch.

The sunrise was magnificent; the sun appeared surrounded, as it does at a high degree of cold, by small suns, and its light appeared more dazzling from the contrast with the extreme cold.

The travelers were obliged to pour rum down their throats so as not to touch the edge of the metal cups, which would have been as dangerous as if they had been red hot; but the rum had lost all its strength and liquidity, and was as flat and thick as oil.

It was impossible to smoke either cigars or tobacco in short pipes, for very soon nothing but a piece of ice remained in the mouth.

The metal of the instruments was just like red hot iron to the touch, as were some lockets, which some of the travelers, romantically, but imprudently, continued to wear next the skin.

M. Payer says that so great an amount of cold paralyzes the will, and that, under its influence, men, from the unsteadiness of their gait, their stammering talk, and the slowness of their mental operations, seem as if they were intoxicated.

Another effect of cold

is a tormenting thirst, which is due to the evaporation of the moisture of the body.

It is unwholesome to use snow to quench the thirst; it brings on inflammation of the throat, palate, and tongue. Besides, enough can never be taken to quench the thirst, as a temperature of 35¼° to 58° below zero Fah. makes it taste like molten metal. Snow eaters in the North are considered as feeble and effeminate, in the same way as is an opium eater in the East.

The group of travelers who traversed the snow fields were surrounded by thick vapors formed by the emanations from their bodies, which became condensed, notwithstanding the furs in which the travelers were enveloped. These vapors fell to the ground, with a slight noise, frozen into the form of small crystals, and rendered the atmosphere thick, impenetrable, and dark.

Notwithstanding the humidity of the air, a disagreeable sensation of dryness was felt.

Every sound diffused itself to a very long distance, an ordinary conversation could be heard at a hundred paces off, while the report of guns from the tops of high mountains could scarcely be heard. M. Payer explains this phenomenon by the large quantity of moisture in the arctic atmosphere.

Meat could be chopped, and mercury used in the shape of balls.

Both smell and taste become greatly enfeebled in these latitudes; strength gives way under the paralyzing influence of the cold; the eyes involuntarily close and become frozen.

When locomotion stops, the sole of the foot becomes insensible.

It is somewhat curious that the beard does freeze; but this is explained from the air expired, falling, being immediately transformed into snow. The cold causes dark beards to become lighter; the secretion of the eyes and nose always increases, while the formation of the perspiration altogether ceases.

The only possible protection against the cold is to be very warmly clothed, and to endeavor as much as possible to prevent the condensation of the atmosphere, while the much vaunted plans of anointing and blackening the body are pronounced to have no real value.

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NEW YORK, SATURDAY, AUGUST 21, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

THE USES OF NATURE.

Nature has kindly filled the world with attractions which are rich enough to suit the tastes of the most fastidious, and varied enough to gratify the wishes and supply the wants of all. These were made for those who need them and would be benefited by them; and it is but justice to such to protest against the practices of those who monopolize the places of popular resort, and uses them only for the sake of personal gain.

At Niagara, for instance, not one of Nature's wonders, that is capable of being concealed can begin to attract attention, before man's cupidity closes it from view, or obstructs the way to it and says: "You can't see Nature's exhibition till you pay me for it." So at Natural Bridge, a grasping individual has built a high, close fence around all the places that command a good view of that grand structure, and he must be paid before the benevolence of the God of Nature can be enjoyed. At every eligible locality on the sea beach, at mineral springs, on mountain peaks, hotels are erected and the appearance of the place is modernized till men have destroyed, as far as in them lies, the primitive beauty and wild grandeur of Nature. But the places are made attractive and convenient for visitors, and should not be too severely criticised

All these instructive and ennobling works of Nature are so manifestly designed for the free benefit of all that no man can appropriate them to private use, to the exclusion of others, without doing a gross injustice to the rest of mankind. The spirit that leads men to such perversion of the gifts of Nature would prompt them to shut up, if they could, the sun which dispenses light, warmth, and vitality to rich and poor alike, the gorgeous beauty of the sunset, the flowers, and the fields, the grandeur of the ocean and its tributaries; and dole them out, by careful measure, only to those who would pay the price which selfishness and avarice had set upon them. We can look upon and enjoy a neighbor's finely proportioned horse, the skillful architecture of his house, the taste displayed in beautifying his grounds, his rich and waving fields of grain and grass, his trees laden with foliage and fruit, and he never thinks of charging us for the delicious pleasure we have received. He would consider it an insult if we should offer to pay him. But by his own skill and toil he has afforded us happiness, and therefore benefit, and would have the right, if the disposition prompted, to receive pay for the benefit given. But what right has any man to extort money from those who enjoy the free beauties of Nature, when he has expended nothing to make those beauties, and when the enjoyment which they give to others does not harm or discommode him? What is it but the very quintessence of smallness and meanness, an abomination in the sight of God and man?

In most pleasing contrast to the devices of those grasping moneymakers at Nature's expense, appear the parks, museums, horticultural and botanical gardens, where Nature, by the skillful and painstaking hand of benevolence, is displayed in all her beauty and instructiveness. And do not those who thus adorn and cultivate Nature to instruct and bless mankind, receive, after all, the richest reward—the most lucrative pay? Is not Shaw, of St. Louis, worthy of all honor for generously opening, free to one and all, and keeping in order at enormous private expense, his gardens, rich in the vegetation of all climes? Will not the great American Museum of Natural History, in the Central Park, when completed, be one of the grandest benevolent institutions ever established? It is doubtless true that the lamented Agassiz, by his enthusiasm in studying and teaching Nature, and by creating popular interest in her revelations, has added greatly to the pleasure and profit of those who spend their vacations at some of the attractive summer haunts. And if any one could justly demand pay for enhancing the delights which Nature affords, it would be he. But instead of that, he spent his fortune and his vigorous life in building up one of the grandest museums in the world, and has thrown open its doors free to every one, whether he wish to spend a pleasant hour or to study for years. And when, on one occasion, he was offered a rare opportunity to make a small fortune, he replied: "Gentlemen, I have no time to make money."

It is possible for an enterprise to pay a large dividend, and yet return but little money to its originator; and it would be well if the world could learn that money is not the only thing worth living and laboring for. It is too true that, by the great majority of mankind, the money maker, if he succeeds, is envied and respected more than he who gives his life to the study of Nature, and reveals her wealth of mystery and beauty to his fellow men. This is emphatically a utilitarian age. Its all-absorbing question is: "Does it pay?" And while this, in its broad sense, is one of the wisest queries a responsible being can make, in its restricted sense it is one of the most shortsighted. One collecting natural history specimens is always sure to attract, more or less, the attention of the curious; and their first questions will be: "Are you hunting for gold?" and: "Can you make much at that business?" And on being answered in the negative (which is correct only with *their* conceptions), there is always certain to follow an ominous silence, when the interrogator is absorbed in deep thought, and—probably for the first time in his life—is seriously moralizing; and the substance of his cogitations, when plainly interpreted, is just about this: "That man must be a fool to spend so much time, and work so hard, for nothing but pieces of broken rock, and insects, and shells, and flowers, just what we should expect a child to be pleased with." Just in point here is an amusing story told of Professor Agassiz. While driving along the road one day, he saw a choice natural history specimen; and calling a boy to hold his horse, he was off, over the fences, through the fields, and into the bushes to capture it. A man passing asked the youth whose horse he was holding. "I don't know," said the lad, "only he is a crazy Dutchman who has run off out of sight after a butterfly."

Most of the great scientific achievements of the world have been simply labors of love; and many a scientist has made an invention or a discovery that would bring him a fortune if he were to patent it; but he declines to use it for any other purpose than to advance the cause of Science. The world is made richer and happier, and his sufficient reward is the consciousness of the good done, and the credit of doing it.

THE UNITED STATES COMMISSION ON BOILER EXPLOSIONS.

The death of the late distinguished Professor Winlock has left vacant the chairmanship of the Commission on Steam Boiler Explosions. This vacancy will probably be filled by the appointment of President F. A. P. Barnard, LL.D., of Columbia College, New York city. The previous announcement of the appointment was premature, but it has now been made by the Secretary of the Treasury, and is expected to have been confirmed by the Secretary of the Navy, who, with the former, constitutes the appointing power. President Barnard has long been known as one of the ablest and most distinguished of those few scientific men who have always been interested in the practical applications of Science, and he will here have one of the noblest fields, in which to exercise his talents and make his scientific attainments practically useful, that could be offered.

The country is to be congratulated that the two cabinet officers making this appointment, Messrs. Bristow and Robeson, have made so excellent a choice. We know of no man in our own country or in Europe better fitted by scientific attainments, by an acknowledged position among the leading men of his class, by official position, age, and experience, for this position. Those of the readers of the SCIENTIFIC AMERICAN who desire to know something of the methods by which scientific knowledge can be made practically available may find pleasure and profit in the study of Dr. Barnard's report "On the Machinery and the Industrial Processes Illustrated at the Paris Exhibition of 1867."

The Commission now consists of President F. A. P. Barnard, Columbia College, Chairman; Professor R. H. Thurston, Stevens Institute of Technology; Messrs. C. W. Copeland (New York city), J. R. Robinson (Boston), and I. Holmes (Mount Vernon, Ohio).

The commissioners are at work, and we shall hope that much good may be done by them in the dissipation of some of the superstitions beclouding the subject in the minds of many, even among professional and practical engineers, in spreading abroad a knowledge of already ascertained facts, and in the acquirement of some additional knowledge. In the latter direction, they can be probably effectively aided by other men of Science, and by such experienced practical men as are numbered by hundreds among our readers.

QUEER CATTLE.

This is a prolific year for insect pests, and among those that have thriven remarkably well are the *aphides*, or plant lice. In some parts of New England, we have seen the foliage of fruit and other trees almost completely destroyed by them, to the great injury if not the total ruin of the fruit: and we have been told that in other localities the orchards have a sere and yellow look as though scorched by fire. Unroll a bunch of the curled-up leaves, and, if they are not wholly dead and dry, you will find the inner under sides of the leaves swarming with lice.

They are insignificant looking creatures, yet they are among the most interesting and most extraordinary of insects. The injuries caused by them are enormous, and their natural history is remarkable in the highest degree. Their generic name *aphis* describes their character; it is from a Greek word, signifying to exhaust. In their wingless state, their appearance is familiar to every one who has ever had anything to do with plants. Their bodies are short, oval, soft, and are furnished at the hinder end with two tubes for the passage of a sweet fluid secreted from the stomach. (It is this honey dew, as it is called, which causes certain ants to domesticate them, as we do cattle.) Their heads are small, and armed with a long, tubular, three-jointed beak, by means of which they attach themselves to succulent leaves and other parts of plants, and suck out their juices. Their eyes are globular; their antennæ long and tapering; their legs slender and long; their feet two-jointed. The males and females are winged, and also the last brood of asexual individuals: but the early summer brood are usually wingless.

The difference between the different broods is perhaps their most striking characteristic, illustrating as it does that anomalous system of generation, known as *parthenogenesis*, observed among a few species of insects and also in the jelly fish. By Steenstrup the phenomenon is called "alternation of generations." In ordinary generation the offspring resembles the parent: in this extraordinary mode there is a series or circle of individuals, with one or more unlike forms always coming between like forms. Among plant lice, the series begins in the fall by the paring of male and female individuals. The males die: the females also, after laying their eggs, which are hatched as soon as sap begins to flow in early spring. This brood is sexless and, in the great majority of cases, wingless. Though with undeveloped sexual organs, these individuals are capable of reproducing their kind by a sort of budding process. Contrary to the rule among insects, their second generation is viviparous: the young lice are brought forth alive, and may be either winged or wingless, or both. The third generation resembles the second, the fourth resembles the third, and so on, the number of successive broods of the sort having no certain limit, but depending, so far as known, entirely upon the temperature and the supply of food. According to Kyber, a colony of *aphis dianthi* continued to propagate for four years, in a warm room, without the intervention of males. On the setting in of cold weather, however, or in some cases on the failure of nourishment, the weather being still warm, true males and females are produced, the females always wingless, the males sometimes with, sometimes without, wings. It is by the paring of these perfectly sexed individuals that the series begins.

The advantage of this method of propagation is thought to be the facility which the summer broods afford for the rapid multiplication of individuals. It is certain that they

are enormously prolific. In five generations, according to the calculation of Réaumur, the progeny of one *aphis* will amount to six thousand millions; and Duval obtained eleven generations in seven months, when the approach of cold weather killed his specimens. Though individually weak, their capacity for rapid multiplication under favorable conditions makes them a formidable enemy to vegetation.

If it were not for certain other insects, which prey upon the plant lice and keep down their numbers, they would soon make agriculture impossible. Chief among the lice eaters to whom we are so much indebted are the larvæ of the little spotted lady bugs (*coccinella*); and all children should be taught to treat them gently, when they say the nursery rhyme; Lady bug! lady bug! fly away home.

In this connection we may observe that children also sometimes enter the list of lice enemies unwittingly, when they gather from young sumac bushes and other succulent plants the juicy swellings which they call "may apples." These hollow warts are produced by the strings of plant lice, and their interiors will usually be found full of a mealy substance thrown off by the lice, mixed with multitudes of the lice.

Reference has been made to the honey-like secretion of plant lice and the fondness of ants for it. One of the first indications of the colonizing of a plant by these parasites is the double column of ants that will be seen running up and down the stem: those ascending lank and eager, those descending full-bellied and lazy. The lice remain on excellent terms with the ants, and seem to enjoy the caresses by which the latter provoke the excretion of the coveted honey. In return, the ants busily drive away the insect enemies of the lice, clear away their cast-off skins, and sometimes build mud walls around, or earthen domes over, the lice, to monopolize or protect them. The ants have also been seen to colonize the lice on the roots of plants, carefully fetching the larvæ home and planting them in little herds, bestowing upon them the same care and attention that they show their own offspring, carrying them to places of safety when they are disturbed and when they migrate: treating them in short as we do our cattle, and reaping a similar reward, as the sweet fluid so abundantly supplied by the lice forms the chief nutriment of their keepers. No reports have been received of any society for the prevention of cruelty, etc., among the ants, probably because the formic cattle keepers treat their stock kindly without compulsion.

The injuries caused by plant lice are mainly such as naturally follow the withdrawal of sap from roots, stems, or leaves before it can contribute to the nourishment of the plant. If the root is first attacked, the whole plant puts on a sickly appearance, and soon dies from exhaustion. When the leaves are attacked, they curl up, cease to grow, and, if the lice are sufficiently numerous, perish and drop off prematurely. In other cases tumors are produced on the leaves or stems, similar to oak galls. There are about thirty species of *aphides* known in this country.

CONSTANCY OF THE OCEAN LEVEL.

The upheavals and depressions of the earth's crust were already recognized by the philosophers of antiquity. Aristotle found it necessary to correct some philosophers of his day, who imagined that the surface of the ocean was becoming lower by the gradual drying-up of the water. He says: "Only those of narrow views and small experience attribute local changes to an overthrowing of the whole globe. In support of their view, they bring forward the drying-up of seas and the existence of land where formerly it was not; and give authentic facts, from which, however, they deduce false conclusions. It is true that certain spots, heretofore covered with water, now form portions of the continent; but the contrary is also the case, and any one who studiously examines the facts will find that the sea has invaded and submerged several parts. Such is the explanation of Deucalion's flood, the ravages of which were more especially felt in Greece, and which, among other provinces, was most terribly felt in ancient Hellas, at that time inhabited by the Selles, and by the people named Greeks, but now called the Hellenes."

So far Aristotle. His theory evidently was that the amount of water in the ocean, and therefore the level of its surface, is constant, but that the land is ascending in one spot and descending in another. The latter is most forcibly illustrated by the historical accounts of the Straits of Gibraltar, which are evidently, as well as the British Channel, a conquest by the ocean over the gradually sinking land. Avienus quotes a measurement, on the authority of Dæmon of Amphipolis, which (reduced to our unit, the mile) makes the width of the Straits at the narrowest place not quite three miles. Then he quotes a subsequent measurement, made by Euctemon of Athens, who found it four miles. Next we find that Scymmes of Chio measured it, in the year 143 before our era, and found it 13 miles at the Atlantic outlet, between Spartel and Trafalgar, which now is 26 miles in width. Turanius Gracilis, about 50 years before our era, gives the width of the narrowest place, from Mellaria in Spain to Cape Blanco in Africa, as 4½ miles. Strabo gives the greatest breadth as nearly 7 miles, while Pliny, who had been in Spain and had visited the Strait, gives it as 7½ miles for the narrowest part, and about 10 miles for the widest part. Bishop Victor measured the distance in the year of our era 500, and found it to be 12 miles; while the present Spanish measurement is 14 miles.

Besides the evidence of a gradual widening and probable sinking of the land of both shores, we find the positive evidence of the sinking in the account of Avienus, who speaks of the two wooded isles in mid-channel, on which were built a temple and altars in honor of Hercules. These were the celebrated Pillars of Hercules of the ancient authors. The Carthaginians "were obliged to build flat-bottomed vessels, so as to be able to sail over the shallow water of the Straits," according to Avienus, who also says that Hannibal had reported that there was "a bottomless and boundless sea farther to the west," which, as it corresponds to the Atlantic Ocean, puts the locality intended to be described beyond doubt.

Pliny visited the Straits, and speaks of a low lying island, covered with wild olives, and upon which were the remains of the Temple of Hercules. Pomponius Mela, a Spaniard, living several centuries later, and to whom these regions were very familiar, describes the Straits as a channel broken by a number of small islands. At present they have all disappeared, and the largest ships sail freely over every portion of these waters.

In 1728, there happened a very low tide, and on this occasion the remains of the famous Temple of Hercules were distinctly seen in the oceanic part of the Strait, and some souvenirs were even obtained for preservation.

Ignacio Lopez de Ayla mentions, in his "History of Gibraltar," that the sea covers the greater part of the land on which stood the ancient city of Mellaria. In the bay of Gibraltar, the sea has engulfed a part of Carteia and Algesiras. Nine miles west of Tarifa was the city of Belon, at the shore of the Strait; and this is now engulfed, while the traces of its existence are seen below the waves.

Lastly Colonel James, in his "History of the Straits of Hercules," mentions that during an earthquake, the site of Cales disappeared, together with the small islands opposite the city of Bactes, near Tarifa; and a rock named "La Perle," once an island, sank, and is now covered with more than 12 feet of water at low tide.

The gradual sinking in this neighborhood is balanced by upheavals in other regions: which are very marked, well established by observation, and carefully measured in the northern part of Sweden and Norway, where the sea, especially the northern part of the Baltic, appears to retire from year to year, and leaves villages, formerly situated at the shore, a few miles inland. The Azores are rising, so is the island of Santorin, and the island of Julia. The former sea port of Aigues Mortes is now nine miles from the shore; while the celebrated Temple of Serapis, at Puzzuoli, for many centuries engulfed, is now uncovered, and is visited by travelers and tourists.

EXPERIMENTAL STEAM BOILER EXPLOSIONS.

The work of the United States Commission on the causes of explosions of steam boilers, which was (as we have elsewhere explained) interrupted by the death of the late chairman, has been recently resumed.

The Commission have two stations, one at Pittsburgh and the other at Sandy Hook, at each of which are a considerable number of steam boilers which are to be devoted to the various purposes comprehended in the programme of investigation. Some experiments were recently made at Sandy Hook, and others are to be made later in the season at Pittsburgh. As the Commission have been informed by counsel that they may be held legally responsible for any injury which may happen to visitors during their their experiments, they permit no spectators to be present, and reporters are compelled to obtain their information as best they can. The members reserve the details of their experiments for their official report; but we are able to present to our readers some interesting particulars respecting the later work at Sandy Hook.

The work in hand was a series of experiments on the overheating of boilers, arising from low water The Committee on the Sandy Hook station have had preparations for the summer work going on for some weeks. On July 9 the committee, Mr. Copeland and Professor Thurston, commenced the work of comparison of instruments, and of preparation of details preliminary to this special investigation, and on Saturday, July 11, had completed their task. On the following Tuesday, July 13, the Commission met at Sandy Hook, and experiments were at once commenced, and occupied two days. The boiler experimented upon was a plain cylinder boiler, set in brickwork in the usual manner. In each experiment, the boiler was filled with water, a fire started, and, when the fire was in good order and the steam at the right point, all water was blown out; the boiler was allowed to become heated to the desired temperature, as indicated by a pyrometer inserted within it, and, at the proper moment, the feed water was introduced by a force pump. It was only on the second day that this severe usage produced the destruction of the boiler. At each occasion, on the introduction of the water, the steam pressure jumped up suddenly, the safety valve opened, and, the water still continuing to enter, the boiler pressure dropped almost as rapidly as it had risen, and the boiler cooled down on each occasion (except the last) without apparent injury, and without having even started a seam, although the metal had been red hot.

The last experiment resulted in the explosion of the boiler and the destruction of its setting, and interrupted the work. The succession of phenomena was precisely as already described; but the temperature of the boiler was higher, probably a bright red on the bottom, and the pressure of steam was about 60 lbs. when the explosion occurred. It had fallen somewhat from the maximum, attained the moment before.

These experiments illustrate the facts which we have often presented to the readers of the SCIENTIFIC AMERICAN, in our remarks upon the method by which low water in steam boilers becomes an element of danger. When the boiler is strong, of good tough iron, and not too seriously overheated, it may not be exploded on the introduction of water. But there is invariably a development of steam immediately upon the entrance of the feed water, producing a rise of pressure which will be directly in proportion to the weight of iron overheated, and the excess of temperature attained; and the suddenness of this rise will be proportional to the promptitude with which the boiler iron discharges its heat into the water first entering. This rise may be so sudden and so great that the safety valve cannot relieve the pressure promptly, in which case the boiler, if not very strong, may be exploded. Again, the plates, if heated to a red heat, lose a large proportion of their strength; and the boiler, thus weakened, may explode at the ordinary or a lower pressure. Still another conspiring cause of injury may be the sudden and irregular contraction, causing strains which assist even a low pressure to produce explosion.

The *débris* on the Sandy Hook Station is now cleared away, and, before our remarks meet the eyes of our readers, we presume that the Commission will have completed this interesting series of experiments. Engineers have long been desirous of knowing where the limit between imminent danger and comparative safety is to be found in cases of low water, and we hope that these experiments, which are on a large scale, and are more nearly illustrative of the conditions of ordinary practice than those made, forty years ago, by the Committee of the Franklin Institute, may go far toward determining that limit. Still, that point becoming known, we shall not advise those of our readers who handle steam boilers to carry their water low in the conviction that they can keep within the dead line.

SCIENTIFIC AND PRACTICAL INFORMATION.

OXYGEN AN ANTIDOTE FOR PHOSPHORUS POISONING.

MM. Threinesse and Casse have found that injections of oxygen into the veins neutralize the toxic effect of phosphorus. The gas must be pure, and free from all admixture with air, and must be introduced very slowly. The precise apparatus used is not described; and it appears that the quantity of gas required is very large, several cubic feet being administered to an animal weighing twenty pounds. The results, however, were in every way successful.

THE NITRIFICATION OF ARABLE EARTH.

Recent experiments of MM. Boussingault and Schloesing are of considerable importance with reference to the theories of fertilization of soils and the utilization of manures, since they bring to light a number of interesting facts, which are summarized in the following conclusions: 1. Arable earth does not become nitrified at the expense of the nitrogen gas in the atmosphere. Agriculture has nothing to expect, from that source, which will tend to the profit of the crops. 2. The theory of a nitrification resulting from the combination of nitrogen gas and oxygen, in the presence of matters rich in hydrogen and carbon, according to the experiments above noted, is no longer sustainable. 3. The source of nitrogen of nitrates formed in the soil should be considered, in the absence of positive proof to the contrary, as reposing only in the nitrified organic matters combined with the mineral elements of the soil. 4. Nitrates in decomposing in the soil, under the influence of a reducing atmosphere, yield but a small fraction of their nitrogen, under the form of ammonia retained by the earth by virtue of its absorbing power. The balance of the nitrogen of the nitric acid returns to a gaseous state, and thus becomes lost to the crops.

THE DISCOVERY OF PROTOSULPHIDE OF CARBON.

It is generally well known that, chemically, oxygen and sulphur greatly resemble each other. The sulphide of carbon, however, analogous in properties and composition to carbonic acid, has hitherto been considered the sole sulphuretted compound of carbon, there being nothing recognized corresponding to carbonic oxide to the sulphur series. M. Sidot has recently made the important discovery of protosulphide of carbon, which compound he obtains by subjecting bisulphide of carbon to sunlight, when the liquid undergoes a profound decomposition. Half of the sulphur separates to be again dissolved in the bisulphide not yet altered, and at the same time a black powder is precipitated, which is the protosulphide sought for. This, washed and purified, is destitute of taste or odor, and is absolutely insoluble in neutral solvents. Acids act upon it, giving rise to more or less complex products. The author proposes to undertake a series of extended investigations into the properties of the new body.

TEMPERED BORACIC ACID.

Tempered glass submitted to the polariscope exhibits centers, having a kind of activity under the light, but which disappear when the glass is annealed. According to M. de Luynes, boracic acid, cast and submitted to hardening, acts like glass, with the difference, however, that the peculiar property above noted is not dispelled on annealing. When submitted to moist air, a small lens of the acid undergoes curious internal modifications, resulting in two cones, disposed apex to apex, being formed within, which offer the most varying accidents of shape. M. de Luynes suggests that an analogous swelling may take place in other vitreous substances, and points out that certain geological phenomena may be traced to such cause.

EXPECTED RESIGNATION OF THE COMMISSIONER OF PATENTS.

The New York *Tribune* states that Commissioner Thacher is about to resign the office, and is to be succeeded by R. Holland Duell, Esq., of Courtlandt county, N. Y., formerly a Member of Congress. Mr. Duell is a gentleman of ability and varied attainments, possessing rare capabilities for the administration of Patent Office affairs. He ought to make a good Commissioner, and we think he will.

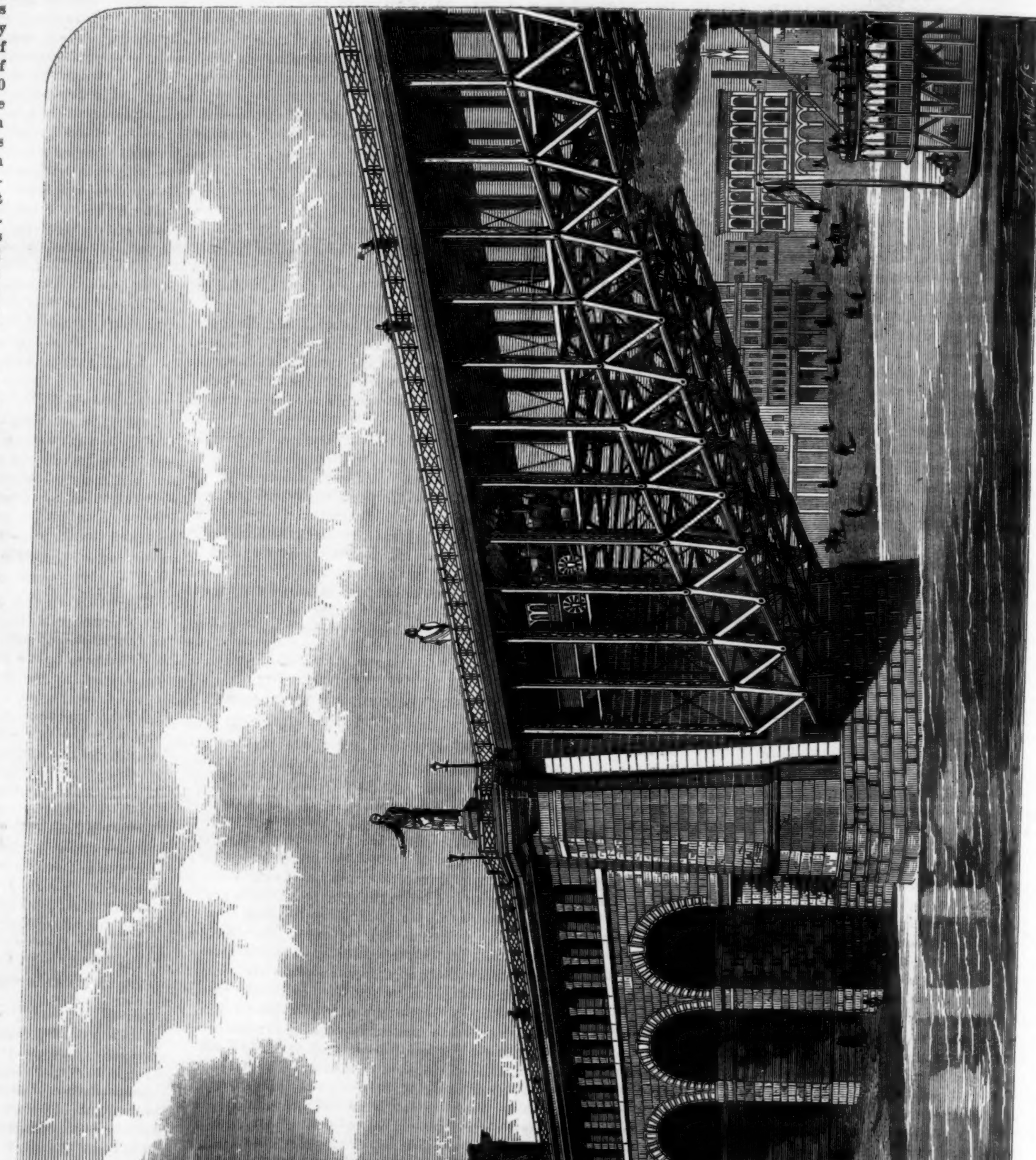
THE ST. LOUIS BRIDGE.

We give herewith a perspective view of the west abutment, and about two sevenths of the shore span of the stupendous bridge across the Mississippi river at St. Louis, Mo. This engraving will give our readers a much better idea of the magnitude and beauty of this remarkable work than anything yet published. The proportions of the bridge may be inferred by comparing them with the figures on the side of the river beneath the arches. The individual standing with his back against one of the small piers, with arms folded, surveying the father of waters as he rushes past the city, is only about as high as two and a half courses of the granite masonry of the pier, and he stands about 40 feet below the carriage way of the bridge. Seventy feet above him the iron horse is seen with its cloud of smoke emerging from the sandstone arcade which surmounts the five stone arches that carry the viaduct over the St. Louis wharf. The railway tracks are below the carriage way and foot walks, and the steam trains in no manner interfere with the local traffic of St. Louis, as the bridge is connected with a tunnel under the city.

The towers, which terminate the bridge proper at each end of the structure, contain elevators and stairways for the convenience of pedestrians on the wharfs on both sides of the river.

The St. Louis bridge will be found, if compared with other great bridges of the world, to surpass them all in several important particulars. In the massiveness of its masonry and the depth of its foundations, it stands alone. One of its channel piers and one abutment pier stand on the marble rock over 100 feet below the river's surface. In the length of its spans there is nothing equal to it in existence, except in suspension bridges. Its two shore spans are 500 feet each in the clear, and are built of masonry, and the middle one is 520 feet.

In capacity it far excels all others yet constructed or designed. The Brooklyn suspension bridge, one of the remarkable works of the age, with its 1,600 feet span, is only designed to accommodate local traffic, and will not possess sufficient strength to sustain steam trains. The suspension bridge about to be constructed over the Hudson, at the Highlands, is only calculated to carry one railway track across the river on its grand span of 1,600 feet; but the business that will be borne across the Mississippi by the St. Louis bridge will greatly surpass that of any other. Already thirteen important lines of railway, says *Engineering*, are preparing to throw their traffic across its arches; and above their trains, on a wide street, now rolls the domestic commerce of the largest inland city in America. One of the widest and most central avenues of St. Louis is extended by it directly across the Mississippi, thus connecting, by a common highway, two of the most prosperous and fertile States in the Union, Illinois and Missouri.



THE WEST ABUTMENT OF THE GREAT BRIDGE AT ST. LOUIS MO.

The Fisher Refrigerator.

We have to acknowledge the receipt of a very finely constructed refrigerator, forwarded to us by the inventor, Mr. J. Hyde Fisher, of Chicago, Ill. It is the tangible result of three excellent devices, patents for which were obtained through the Scientific American Patent Agency, and which together render the refrigerator one of the best both in principle and construction that we have ever examined. The first patent covers the principle of separating the cold and warm air, keeping the latter at the top of the cooling room. This is done by the cold air from the ice chamber entering the cooling room at a point below that at which the warm air escapes. There is a constant circulation so long as any ice remains. The other patented additions are a very ingenious latch for the doors and a tap hole protector, which is so constructed that, when the door is closed, no cold air can escape from the refrigerator around the faucet. We learn that meats, vegetables, and fruit have been kept in the cooling chamber for periods of several months at a time in perfectly sweet condition. The preserving properties of the invention have been put to a very severe test in its application to refrigerator cars, of which several, constructed on the principle described by Mr. Fisher, have for some time past been used as a means of transporting western fruit, etc., to eastern markets. For fish dealers who freeze a large stock of fish, in order to keep the same over considerable lengths of time, the system has proved itself eminently suitable, since it has already been successfully adopted in the construction of several large cooling houses in western cities. These last mentioned receptacles have been, and we are informed will in future be, built under the direct supervision of the inventor.

The manufacturer of portable refrigerators and boxes is Mr. H. C. Van Schaack, Jr., of 991 Michigan avenue, Chicago, Ill., who may be addressed there for further information.

Magnetic Railway Locomotives.

In an arrangement lately devised by M. Burgin, the entire axle, with its wheels, is made into one electromagnet. The wire is wound with increasing thickness from the middle towards the wheels, in the case of external cranks, but uniformly in the case of internal. With coupled wheels the wire is so arranged that there is an alternation of poles, the piece of rails between two poles forming the armature. A locomotive model (without engine or boiler), having three pair of wheels and internal cranks, was placed on a line with 30 per cent incline. Five Bunsen elements supplied the force, and a weight of 25 lbs., with cord, passed round the axles. The machine weighed 18 lbs., and, with no current flowing, the wheels merely slid on the rails in position; but when the circuit was closed, the model ran up the incline. When the brake was applied (and weight detached), the model could be held on the steep incline if the current were passing; but if not, the wheels began to slide and the locomotive went downwards with increasing pace; but this descent was promptly stopped when the current was made to flow again.

SMITH'S IMPROVED BALE TIE.

The invention illustrated herewith is a new tie designed to secure the wires used for binding hay bales. The usual mode of fastening these wires is wasteful, since about a foot on each end is employed to twist together and tuck under, so that, of the number of bands usual on each bale, fully six feet remain unutilized. Again, considerable wire is lost by cutting the bands rather than wasting the time necessary to untwist them. The present device is intended to prevent this waste, by using no more wire than is just necessary to secure the simple fastening, and, at the same time, to afford the latter of such a form as may be quickly and easily loosened

Fig. 1

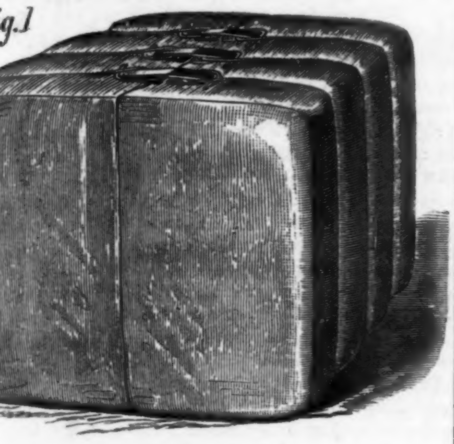


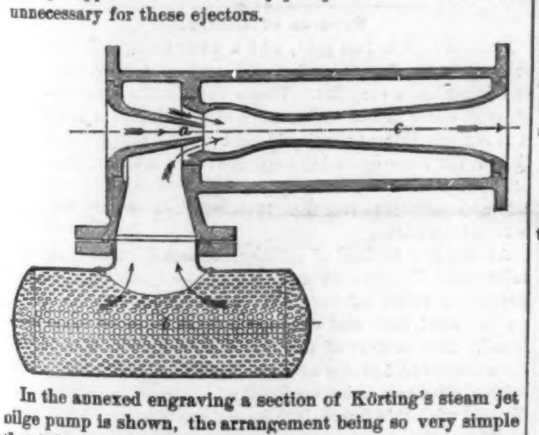
Fig. 2

The invention consists of a double hooked piece, A, Fig. 2, having V-shaped jaws, into which the wire (size from 10 to 14) is secured. Small loops are first made on the ends of the wire, and these are slipped over the hooks while the bale is still in the press. The expansion of the bale, on its removal, draws the bands tight, and the jaw of the coupling is so constructed as to prevent the wire slipping. The ends of the wire are turned under the standing part so as to be out of the way, and are not liable to catch in transporting the bale. To unfasten the tie, it is only necessary to seize the ends of the wire with pincers and bend them back, when they will readily slip from the holes. Fig. 1 shows the bands in place on the bale.

For further particulars address the inventor, Mr. Isaac T. Smith, 1,532 Main street, Richmond, Va.

KORTING'S STEAM JET BILGE PUMP.

The application of an ejector to throw the water out of a ship's hold is an expensive way to attain this purpose. For the amount of steam necessary for working an ejector is found to be ten to fifteen times the amount used to do the same work by a donkey pump, or by the ordinary bilge pump in connection with the large engines. But on the other hand, it is an ascertained fact that such ejectors may be relied upon as to their never-failing surety in working, and in this respect they are most decidedly superior to most pumps in use. All those parts that oftentimes proved to be fatal to the prompt application of ordinary pumps in case of need are unnecessary for these ejectors.



In the annexed engraving a section of Körting's steam jet bilge pump is shown, the arrangement being so very simple that it hardly requires any explanation. The steam coming from the boiler enters through a nozzle, *a*, and forces the bilge water, after having passed the suction filter, *b*, through the diverging tube, *c*, whence it is discharged into the sea by means of a pipe through an opening in the ship's side. The arrows indicate the directions of steam and water.

The Currant and Raspberry Moths.

A correspondent of the *English Mechanic* writes as follows: "A destructive pest among the fruit bushes is the *abraxis grossulariata*, known under the name of the gooseberry caterpillar, the magpie, or the currant moth. This moth and its caterpillar are shown in Fig. 1, and will, doubtless, be easily recognized when it is mentioned that the wings are whitish with black markings, and a few yellow blotches or stripes here and there; the caterpillar is yellow and black. The larvæ of this moth spin the leaves together in the autumn and winter, in position ready to devour the leaves as soon as they appear in spring. The remedy for this is to remove all the dead leaves from the bush in winter and burn them, or else dig, close handy, a hole at least two feet deep, into which you may rake the fallen leaves, and then remove

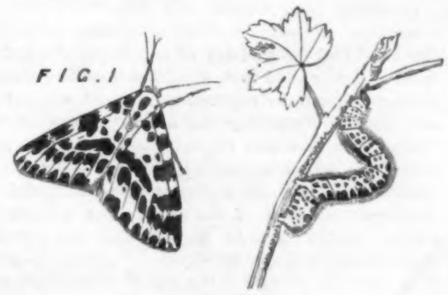


FIG. 1

from underneath the bush about two inches of the top soil, putting it on the leaves in the hole, and then filling up with the soil previously removed. Tan and decayed manure, with a dusting of lime, may then be put under the bush, and the result will be found satisfactory, in freedom from early attacks of the pest, and a good crop of fruit. If, however, the bush should become infested with larvæ hatched from eggs deposited by the moth which has arrived at the perfect stage on some neighbor's domain, the best remedy is a dusting with powder of white hellebore, which is easily laid on and under the leaves by means of a muslin bag. Like most of the other garden pirates, this insect can be exterminated, as far as one's garden is concerned, by a little energy at the proper time.

Another insect, *lampronia capitella*, also attacks currants. This moth is the raspberry grub, and is shown in various stages in Fig. 2. It is a pretty little moth, and its larva is unmistakable, being a bright red. If, on examining the young buds or shoots of the raspberry canes, we find a larva of *l. rubiella* on slitting open a bud or shoot, it will be tolerably correct to conclude that all the buds which appear to be in a similar condition are occupied by one of these destructive little pests. It will be sufficient if a sharp pinch is administered to the bud between finger and thumb, because that method has the merit of leaving the shoot to assist in elaborating the sap. The buds thus affected will not yield fruit:

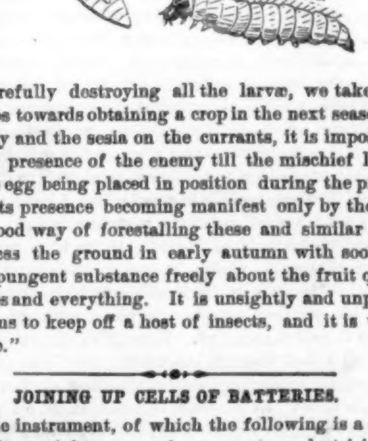
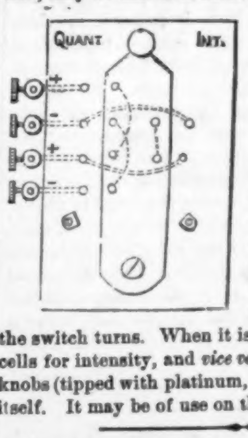


FIG. 2

but by carefully destroying all the larvæ, we take a good many steps towards obtaining a crop in the next season. Like the rose fly and the sesia on the currants, it is impossible to detect the presence of the enemy till the mischief has been done—the egg being placed in position during the preceding autumn, its presence becoming manifest only by the effects. A very good way of forestalling these and similar pests is to top dress the ground in early autumn with soot, and to dust that pungent substance freely about the fruit quarters, over leaves and everything. It is unsightly and unpleasant, but it seems to keep off a host of insects, and it is valuable as manure."

JOINING UP CELLS OF BATTERIES.

The little instrument, of which the following is a description, may be useful to some of our amateur electricians. It is a switch for joining-up cells for quantity or intensity by one movement. The engraving shows one for two cells, but it could be made for any limited number.



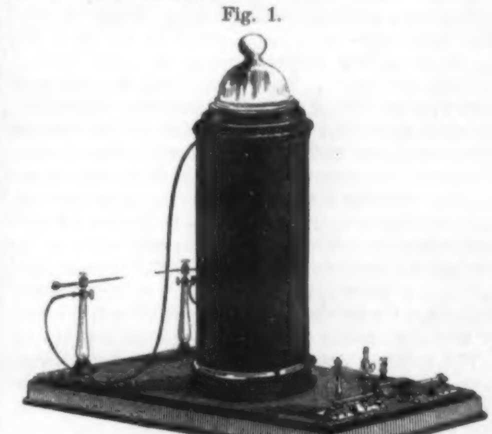
To the four binding screws are attached the wires from the cells, the line wires being fastened to the outer screws. The connections on the switch are marked in single dotted lines: the double lines represent those under the wooden slab on which the switch turns. When it is moved to the right, it joins the cells for intensity, and *vice versâ*. The small circles are brass knobs (tipped with platinum, if preferred). The rest explains itself. It may be of use on the lecture table.—*A. Trotter.*

PICRIC ACID dyes leather a good yellow without any mordant; it must be used in very dilute solution and not warmer than 70° Fah. Anilin blue modifies this color to a fine green.

THE ELECTROSTATIC OR INDUCTION COIL.

It has been proved by experiments that the quantity of electricity traversing the secondary wire of an induction coil is the same whether the current is produced by the closing or by the opening of the primary circuit. The difference between the two currents, in respect to their electromotive force, is, however, very marked, that of the opening current being far greater than that of the closing one, although, as above stated, the actual quantity of electricity is the same in both cases. The reason of this is that, when the primary or battery circuit is closed, it is opposed by the extra or self-induced current, and hence the former requires a certain length of time to attain its full force. When, however, the primary circuit is broken, the extra current is in the same direction, and therefore does not delay the action to the same extent as in the first instance. The primary current disappears almost instantaneously, or at all events in much less time than is required for it to attain its full strength. The duration of the induced or secondary current corresponds with the time occupied in the charging or discharging of the primary wire by the battery current. As the same quantity of electricity is produced in the secondary wire in each case, it is obvious that it must necessarily pass through the circuit in a shorter time at the breaking than at the closing of the primary circuit, and thus its potential or electro-motive force must be correspondingly greater.

Fig. 1.



The most striking example of this action is afforded by th electro-magnetic induction coils of Ritchie, Ruhmkorff, Ladd, and others, which are now made to produce the most powerful electrostatic effects, far surpassing those of the frictional electric machine.

The discovery of the electrostatic properties of the induced or secondary current was made by Professor C. G. Page, of Salem, Mass., who (in 1836) published the first account of an induction apparatus, consisting of a primary coil with a secondary coil wound upon it, of many times its own length. Professor Page was also the originator of the automatic circuit breaker, and of the devices for rendering the same adjustable. Ruhmkorff, of Paris, constructed in 1851 the coils which bear his name. By careful insulation of the secondary wire, he succeeded in producing sparks of nearly one inch in length, capable of charging a Leyden jar with great rapidity. Ritchie, of Boston, in 1857, vastly improved the induction coil, and in successive instruments obtained sparks of 6, 10½, and 12½ inches. The cause of the superiority in Ritchie's coils is due chiefly to an improved method of winding the fine wire coil, by which it has been found possible to use with success a wire of several hundred thousand feet in length, while the limit in the instruments as constructed by Ruhmkorff was about ten thousand feet. Fig. 1 shows the external appearance of one of Ritchie's medium sized coils, giving a spark of nine or ten inches in length.

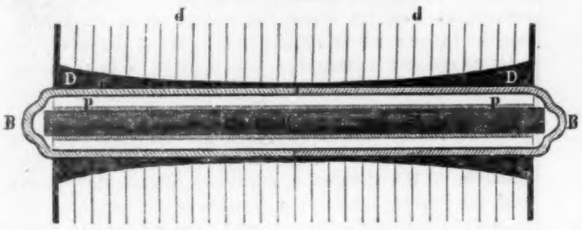
The chief parts of this apparatus are the primary and secondary coils, an interrupter to the primary circuit, and the condenser. In the instrument shown in Fig. 1, about 68,000 feet of silk-covered wire, 0.012 of an inch in diameter, is wound upon the exterior coil. The primary or inducing coil consists of about two hundred feet of copper wire, one seventh of an inch in diameter (No. 9), the ends of which terminate in binding screws upon the base. A heavy glass bell, seen at the top of the coil, insulates the primary from the secondary circuit, its foot being turned outwards by a flange as wide as the thickness of the coil. The induction coil, for more perfect insulation, is also encased in thick gutta percha. The ends of this coil are carried by gutta-percha-covered conductors to the two glass insulating stands, seen at the rear of the instrument, where they end in sliding rods, pointed with platinum at one end, and having balls of brass at the other. The interrupter devised by Mr. Ritchie consists of a toothed wheel, which raises a spring hammer, the blows of which fall upon an anvil, breaking contact between two heavy pieces of platinum. The European induction coils are usually provided with an automatic circuit breaker, but comparative trials have shown that there is an advantage in varying the rapidity of the interruptions, according to the class of effects to be produced, and that a certain time is requisite, for the complete charge and discharge of the soft iron wires which form the core, longer than the automatic circuit breaker allows.

The object of the condenser is to destroy by induction the greater part of the force of the extra current, which would otherwise materially diminish the power of the apparatus. In the instrument shown in the figures, the condenser consists of 144 square feet of tin foil, divided into three sections (two of 50 and one of 40 feet), carefully insulated by triple folds of oiled silk and placed within the base of the instru-

ment. The battery force needed to operate this instrument consists of two or three large-sized Bunsen cells.

Fig. 2 shows the internal construction of one of the large horizontal coils of recent construction, arranged upon Ritchie's plan, which has been adopted with slight modifications by the leading instrument makers of every country. C is the core, consisting of a bundle of soft iron wires. This is separated, by a thin layer of some suitable insulating material, from the primary coil, which usually consists of two or more layers, contained in the space, P P. The two coils are

Fig. 2.



separated by two heavy glass tubes, B B, closed at the outer ends, while their open ends meet in the middle of the coil. D D is a hard rubber bobbin, the tubular portion of which is thinnest in the middle and thickest near the ends, as shown in the figure. A great number of thin insulating disks, *d d*, of which only a few are shown in the figure, divide the bobbin into compartments, the wire being wound up in flat spirals, two or more of these occupying the space between each two adjacent disks. The various compartments communicate with each other, so that the secondary wire is continuous from end to end. The coating of silk and varnish upon the wire affords sufficient insulation between the convolutions in each compartment, and the disks prevent the sparks from striking through between the compartments. The coil may thus be said, as it were, to be insulated wholesale and retail, and the separation from each other of the different parts is complete. In regard to the external insulation, less is required in the compartments in the middle of the coil, where the tension is smallest, and there is the least danger of the electricity breaking through into the primary coil. The greatest tension is found in the compartments nearest the two ends of the coil, which is the reason why the tube is made thinnest in the middle and thickest at the ends. Another reason is that the thickness at the ends lessens the inductive Leyden jar action between the ends of the primary coil.

The largest induction coil yet made is that of the Royal Polytechnic Institute, of London. The length of this coil is 9 feet 10 inches, diameter 2 feet, weight 15 cwt., including 477 lbs. of hard rubber. The core is 5 feet long, and 4 inches in diameter, of No. 16 iron wire. The primary coil consists of 145 lbs. =3,770 yards, of No. 13 wire. The secondary coil consists of 150 miles of wire, weighing 606 lbs., and having a resistance of 33,560 ohms. The condenser is in six parts, each containing 125 square feet of tin foil. With five large Bunsen cells, the spark is 12 inches in length, and with 50 cells this has been increased to 29 inches.

The induction coil constructed by Ritchie for the Stevens Institute of Technology, at Hoboken, N. J., has a primary coil consisting of 195 feet of No. 6 wire. The secondary coil is over 50 miles in length, of No. 36 wire. The core is composed of a bundle of No. 20 iron wires, wrapped in oil silk and cloth. With three large bichromate cells, this coiled has given sparks 21 inches in length, capable of piercing through solid glass three inches in thickness.

Correspondence.

The Colorado Potato Bug.

To the Editor of the Scientific American:

In a letter in your paper, on page 52 of your current volume, on the Colorado potato beetle, by Thomas A Cotchett, I discover the writer's want of knowledge of the habits of this insect pest; with which if he were better acquainted, he would readily admit that his plan, so far as driving this pest from our land, would be a perfect failure. The potato beetle does not depend upon the potato or on any one vegetable for its food, but will feed and thrive equally well upon the tomato and the thistle, and on various weeds which are as numerous as the insect pest itself. From the experience of the past three years in the ravages of this beetle, I will say that the following is so far the easiest and most practical way of avoiding injury and saving labor and the potato crops.

1. Let each farmer plant a small patch of potatoes quite early, on which the beetles will readily gather; and let there be vigilance and thoroughness in capturing all of the early or first crop of bugs, either by hand or by the use of Paris green. This done, large fields may be then planted without their being molested by the bugs, to any extent that will injure the crop. This mode is being universally adopted in the West, where we have suffered severely for the past few years.

When our much dreaded pest gets his foot upon England's shore, our friend in London can practice his theory; but we in this land cannot be induced to try it, to the evident detriment of a large portion of planters.

Grand Rapids, Mich. C. J. Dietrich.

A New System of Bridge Building.

To the Editor of the Scientific American:

Being a constant reader of your valuable paper, I have noticed occasionally that, in replying to some of your correspondents, you state that it is a great deal more easy to build on paper than to accomplish the practical part. You may think that this project emanates from the mind of a lunatic; however, a great many more absurd propositions have not only been advanced, but have been worked out with material results.

The following is a specification for a bridge that can be constructed for railroad or other purposes, over a body of unfathomable water, from one to five hundred miles in length: The bridge is to consist of a submerged pontoon (made in sections) of sufficient carrying capacity to sustain the weight of the roadway or superstructure, and is to be so constructed that, should one section become damaged, it can be repaired or replaced without in any manner disturbing the other portions or the bridge. The pontoons are to be anchored where possible, and where impossible, steam power is to be used for holding the structure in position and to counteract the force of the wind. The superstructure or roadway is to be made of light but substantial material, and can be elevated from ten to sixty feet above the surface of the water as circumstances may require. It can be made so as to be opened at any navigable point, from one to two miles in length (using steam power), in fifteen minutes, or opened and closed in thirty minutes JOSEPH SLUSSER.

47 West Water street, Cincinnati, Ohio.

The Tides in the Gulf of Mexico.

To the Editor of the Scientific American:

I have noticed in all the Gulf ports of Louisiana, Florida, and Texas, the very small rise and fall of the tide. In some of them there is but one flood and one ebb tide in each 24 hours, the high water occurring when the moon crossed the upper meridian, and the low water 12 hours later. In other parts, a full tide occurred when the moon crossed the upper meridian, falling off to mean low water in six or seven hours, and a half tide occurred when the moon passed the opposite meridian. The influence of the wind very much affects the rise, fall, direction, and velocity of the currents. It would seem that, from the shape and apparent condition of things, there would be a natural current running up the western shore, following the northern shore around and down the eastern shore; yet, according to my little experience, such is not the case. The reasons why, I should think, the currents would run as I mentioned are probable and natural.

The trade winds are the cause. The northeast and southeast trade winds form their average line of contact at about two or three degrees north of the equator, and their united force forms the equatorial current, which is forced along the northern shore of South America, through the Caribbean Sea, until it strikes the western land and is turned northward up into the Gulf of Mexico, carrying a temperature of about 80°, which accounts for the high temperature of the Gulf Stream. After passing the Campeachy banks, the current turns easterly, running between Cuba and the Bahama banks on one side and the Florida reef on the other, forming the starting point of the Gulf Stream which passes out through the Straits of Florida with considerable velocity, and joins again the waters of the Atlantic Ocean, following the line of soundings on our coast and passing along the southern edge of the banks of Newfoundland; whence its course is nearly east, and its velocity and temperature are very much reduced, the latter being 10° or 12° lower. After passing the banks, this stream is joined by a natural current from the north. The two currents join and run in a southeasterly direction, until near the coast of Africa, and are then known as the Guinea current. It draws down towards Cape De Verde, whence the current runs more easterly, and again feels the effect of the northeast trade winds, which again accelerate the motion and keep up the grand circle.

This is my crude idea and opinion in regard to the causes of the Gulf Stream, and these conclusions I have arrived at from my own observations in the premises.

In regard to the Gulf of Mexico, there is a remarkable feature in that gulf, which is worth some study and experiment. It is said to be possible to keep the sea from breaking by pouring on oil. In some parts of the Gulf of Mexico the oil is supplied. From Ship Island westward, I have often sailed through large patches of this oil down to the Campeachy banks, and down the coast of Texas to the Rio Grande river. In passing through these oil spots, the surface is comparatively smooth, and the strong petroleum-like smell will tell you in the night of the presence of the oil, although you cannot see it. Now it seems to me that, underlying this part of the Gulf, there must be tremendous oil deposits, which, in some places, have broken through and risen to the surface in quantities for years. For on the coast of Texas, at Brazos, Santiago, Padre Island, and Deckrose Point, there is to be found what the Texans call "sea wax," it washes ashore on the beaches in considerable quantities, and I have picked up large quantities at various times. It resembles pitch, and is found among the sand in pieces, some of them as large as a man's hand. It will float, melt, and burn as well as pitch, and has the same petroleum-like smell as the oil patches. I have no doubt in my own mind about the sea wax being formed by the sun's shining on this vast mirror, extracting the gases and leaving the residue in the condition in which it is found. In the course of time it drifts ashore on the coast of Texas.

Stratford, Conn. TRUMAN HOTCHKISS.

EQUAL parts of American potash and pearlash, 2 ounces each to about 1 quart water, give a good oak stain. Use carefully, as it will blister the hands. Add water if the color be too deep.

The Phonometer.

A new system of fog signaling at sea has recently been invented in England by Captain W. E. Harris, by which vessels in thick weather are enabled to make known to others their whereabouts, and thus materially to decrease the danger of collision. Although signals from fog horns, bells, or steam whistles may be perfectly audible, the condition of the atmosphere is very frequently such as to render it impossible to determine correctly the quarter whence the sound comes. If, however, the people on the meeting vessels are informed, by the peculiar nature of the signals, of the course each is steering, the question of keeping clear is very greatly simplified. The apparatus, to which the name of phonomoter has been given, consists, says the London *Times*, of the mechanism of a clock placed in a horizontal position under a special dial. The seconds are arranged near the outer circumference of the dial, which is about eight inches in diameter, while the hour and minute dial is about two inches in diameter, and is placed on the lower part, where the seconds dial of a watch is usually sunk. There are four seconds hands placed at right angles to each other and radiating from the center of the main dial. Outside the seconds circle are marked five black segments, with intervals between them. One segment measures ten seconds in length, and the other four five seconds each, with intervals of three seconds. Outside the glass which protects the dial, and pivoted at its center, is a brass segment plate, so arranged as to obscure those segments on the dial not required for immediate use, and thus to prevent error in signaling. Around the dial and outside it is a flat ring of metal about two inches broad, on which all the points of the compass are marked.

The apparatus is placed on a stand with the upper part of the dial toward the head of the ship, the stand being fixed on the bridge just by the steam whistle, so that both are under the direct control of the officer in command. In using the phonometer, the compass ring, or dumb card, as Captain Harris terms it, which is a very important feature of the instrument, is moved round until the true point on which the ship is sailing is in line with the ship's head, all the true points of the horizon being thus indicated. These points being accurately known, it follows that all steamers in each other's vicinity fitted with the phonometer will have the true quadrants of the compass distinctly and concordantly represented. The steam whistle or fog horn is the important adjunct of the phonometer, and it is the duration of each whistle or blast and their number that indicate the course of the ship. The black segment covering ten seconds of space is a measure of ten seconds of time, the other segments indicating periods of different duration; and a whistle of ten seconds' duration indicates that the vessel is steering within the quadrant from north to east quarter north.

Assuming this to be the course of the vessel, the brass covering segment would exclude all the other black segments, and the officer would wait until one of the four seconds hands entered that segment. He would start the whistle and hold it on during the time the hand traversed that segment, and shut off steam the moment the hand reached the end of that segment. This operation must be repeated at intervals during the continuance of the fog.

Another ship coming within sound would at once know the course of the first, and would indicate her tack in like manner. Following out Captain Harris's code, two blasts each of five seconds' duration, with an interval of three seconds, represents from east to south quarter east. Three blasts of similar duration and intervals represent from south to west quarter south, while four blasts of the same length and spaces indicate from west to north quarter west. The special object of the four seconds hands is to enable the operator to reply readily to the signals from other ships, which could not be done if the revolution of a single hand had to be waited for. By the peculiar construction of the dial, the necessity of counting the seconds when signaling is entirely obviated.

Process of Gilding.

Place in a plate leaf gold, add a little honey, stir the two substances carefully together with a glass stopper, the lower end of which is very flat. Throw the resulting paste into a glass of water mixed with a little alcohol; wash it and leave it to settle. Decant the liquid and wash the deposit again. Repeat the same operation until the result is a fine, pure, and brilliant powder of gold. This powder, mixed with common salt and powdered cream of tartar, and stirred up in water, serves for gilding.

As another method of gilding, Boutet Mouvel gives the following: Dissolve in aqua regia one grain of fine gold, previously rolled out very thin, in a porcelain capsule heated on the sand bath and concentrated till it is the color of ox blood. Add a pint of distilled water, hot, in which have been dissolved 4 grains of white cyanide of potassium. Stir with a glass rod, and filter the liquid through unsized paper. To gild with this liquid, it is heated a little above lukewarmness, and the articles to be gilt are immersed in it and supported upon a piece of very clean zinc.

G. R. McK. says: "I have been a subscriber to the SCIENTIFIC AMERICAN for several years. I take a dozen other papers and periodicals, but derive more pleasure and benefit from the SCIENTIFIC AMERICAN than from all the rest combined."

J. J. H. says: "I owe half my income to the information I obtained from the SCIENTIFIC AMERICAN."

A NEW hygrometer consists of strips of paper dipped in a cobalt salt solution containing common salt and gum arabic. In dry weather, it is blue, and in wet, rose red.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

NUMBER XXIX.

DRILLING IN THE LATHE.

We have next to consider drilling tools as they are employed in the lathe. For boring very small holes, as in center drilling, it is usual and advisable to revolve the drill and use the dead center and its gear as a feed motion. For small lathes, a small chuck (shown in Fig. 114) is provided. The flat surfaces of such work as may require to be drilled are placed against the face, A A, and a small conical recess, denoted by the dotted lines, is cut in the center of the chuck to relieve the point of the drill when it emerges through the work.

It is obvious that, as a lathe possesses no facilities for chucking work upon the tail stock, work which requires

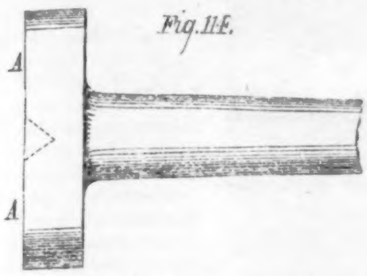


Fig. 114.

chucking, or is too heavy to be held conveniently in the hand, can only be drilled in the lathe by being chucked and revolved, the drill remaining stationary, and fitted into the socket in the tail stock spindle, or else suspended by being held by the work at the cutting end and by the dead center at the other end, and prevented from revolving by the aid of a drilling rest or a wrench. If the work revolves, it must of course be set to run true; and since the setting involves more work than would be required to hold it upon a drilling machine table, it follows that the lathe is only resorted to for drilling purposes in cases in which it is imperative to use it. These instances may be classified as follows

1. Those in which very straight and true holes are required, and in which the point of ingress and egress may be centerpunched, in which cases (the back center of the lathe being placed in the centerpunch mark, and the point of the drill in the other) the drilling is sure to be true.

2. Those in which the work, being very long, can be got into the lathe in consequence of the movable tail stock, when it could not be got into the drilling machine.

3 Those in which, there being turning to be done besides the boring or drilling, the whole may be performed in the lathe.

4. Those in which the holes require to be very true, the work being chucked in the lathe.

The class first mentioned refers to small and light work only, and requires no comment, save that the work should be slowly revolved on the lathe center while the drilling is progressing, so that the work will not drill out of true in consequence of its weight. The second will be treated of under the heading of the cone plate, or cone chuck, as it is sometimes termed; and the third (which usually comprises the fourth) we will proceed to discuss.

The spindle in the tail stocks of lathes are usually prevented from revolving by having a narrow groove along them, into which a small lug, stationary with, and projecting through, the bearing of the spindle, fits. If, therefore, a heavy strain, tending to twist the socket (as would be the case if a drill of a comparatively large size were held by it), is placed upon it, the groove, from its comparatively small wearing surface, soon gets worn as well as the lug, and the edge of the groove bulges, causing the socket to bind in its guide. Tail stock spindles are not, in fact, usually designed to perform such heavy duty; hence it is an error to assign it to them, unless, as is the case in some special lathes, the tail stock spindles, and hence their bearings, are made square to suit the spindles to carry drills for heavy duty. But drills above a half inch in diameter should be held by a center in the shank end of the drill, into which the back or dead center of the lathe may fit: the drill, if a round one, being held by a lathe dog fastened to it and resting against a piece of metal fastened in the tool post of the lathe, thus relieving the tail stock spindle of the torsional pressure. If the shank of the drill is square, a wrench may be substituted for the dog or carrier.

HALF ROUND BITS.

For drilling or boring holes very true and parallel in the lathe, the half round bit shown in Fig. 115 is unsurpassed.

The cutting edge, A, is made by backing off the end, as denoted by the space between the lower end of the tool and the dotted line, B, and performing its duty along the radius, as denoted by the dotted line in the end and top views.

It is only necessary to start the half round bit true, to insure its boring a hole of any depth, true, parallel, and very smooth. To start it, the face of the work should, if circumstances permit, be made true; this is not, however, positively necessary. A recess, true and of the same diameter as the bit, should be turned in the work, the bit then being placed in position, and the dead center employed to feed it to its duty; which (if the end of the bit is square, if a flat place be filed upon it, or any other method of holding it sufficiently tight be employed) may be made as heavy as the belt will drive. So simple, positive, and effective is the operation of this bit that (beyond starting it true and using it at a moderate cutting speed, with oil for wrought iron and steel) no further instructions need be given for its use. It is made as follows

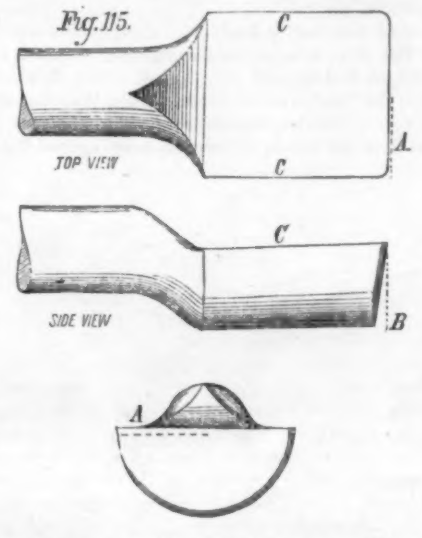


Fig. 115.

Forge it as near to the required size as possible, leaving stuff sufficient to true it up, and from square steel, if it is obtainable. Disregard the question of the cost of material, which, in a tool of this kind, does not represent six per cent of the cost of the finished tool; whereas the difference in quality is as three to one. In order to turn the cutting end between the lathe centers, so as to have the center at the shank end quite true with the turned pair, it must be forged at the end to more than half the diameter, so as to leave sufficient metal to receive the center hole and countersink whereon to turn it. The shank end should be forged square, and should, when center drilled, have a deep countersink. The cutting end must be turned true and smooth, being quite parallel, if to be used for parallel holes, and of the desired taper for taper holes. For parallel holes, all the cutting is performed by the end face, A; but in taper holes, the side edges, C, of the top face also perform cutting duty, and hence the necessity of having the turned end of an exact thickness of half a diameter. After turning, and before removing it from the lathe, a tool having a point should be fastened in the slide rest, its point being made to bear lightly against the turned face, close to one of the edges, C; and the rest should then be passed along so that the point will scribe a line true with the center upon which the tool has been turned, which line will form a guide for filing the top face down to make the tool of the required thickness of one half of its diameter. The edge, A, should be perfectly square with the side or diametrical edges, C C. The circumference of the turned part should have the turning marks effaced with a very smooth file, by drawfiling the work lengthwise, care being taken to remove an even quantity all over. The rake of the tool, as denoted at the dotted line, B, should not be greater in proportion than is there shown.

This tool should be tempered to a straw color and employed at a cutting speed of about 15 feet per minute, and fed at a coarse feed by hand. For use on parallel holes, no part should be ground save the end face; whereas, in the case of taper ones, the top face may be ground, taking as little off as will answer the purpose. It should be borne in mind that, as the steel expands (and therefore becomes larger in diameter) by the process of hardening, the necessary allowance, which is about the one hundredth of an inch per inch of diameter, should be made when turning it in the lathe. Tools of this description, which have a turned part to guide them, or those which depend upon the trueness of their outline or cutting edges to make them perform their duty, and which are apt, in the process of hardening, to get out of true (for all steel alters more or less during the operation of hardening), may be made true after the hardening or tempering by a process to be described in our future remarks on reamers, since it applies more directly to those tools than to half round bits.

To enlarge holes and true them out, the flat drill shown

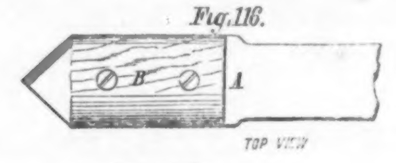


Fig. 116.

in Fig. 116 is employed. It is an ordinary drill made out of flat steel, having pieces of hard wood fastened to the cutting end, A being the steel, and B B the pieces of wood, held on by screws. When the drill has entered the hole, far enough to make it of the diameter of the drill, the pieces of wood enter and fit the hole, steadying the drill and tending to keep it true. It is necessary, however, to true out the hole at the outer end before inserting the drill; for if the drill enters out of true, it will get worse as the work proceeds. The drill is fed to its duty by the back lathe center, placed in the center upon which the drill has been turned up.

The pieces of wood should be affixed before the drill is turned up, and so trued up with the drill, which should then be lightly drawfiled on the sides; and the cutting end, having the necessary rake filed upon it, should be tempered to a straw color, the pieces of wood being, of course, temporarily removed. For use on conical holes, the sides must be made of the requisite cone, and the cutting speed in that case reduced (in consequence of the broad cutting surface) to about 10 feet per minute. (This speed will also serve in boring conical holes with a half round bit.) Such a drill is an excellent tool for ordinary work, such as pulleys, etc., because it will perform its duty very rapidly and maintain its standard size; and it requires but little skill in handling. It is more applicable, however, to cast iron than to any other metal. After the outer end of the hole has been turned true, and of the required size to receive the drill, and when the latter is inserted for operation, it is an excellent plan to fasten a piece of metal, such as a lathe tool, into the tool post, and adjust the rest so that the end of the tool has light contact with the drill, so as to steady it. The lathe should be started, and the tool end wound in by the screw of the rest, until, the drill being true, the tool end just touches it, as in Fig. 117.

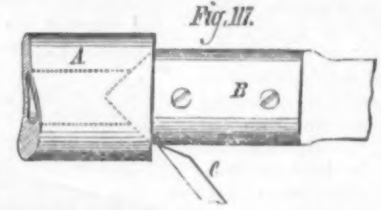


Fig. 117.

The dotted lines denote the hole in the work and the drill point; A represents the work, B the drill, and C the tool end, fastened in the lathe rest, and having its end beveled so as to have contact with the drill as close to the entrance of the hole as possible, in which position it is the most effective. In all cases, when a drill is used in the lathe and remains stationary while the work revolves, this steadying implement should be employed, since it operates greatly to correct any tendency of the drill to spring out of true.

To hold flat drills, or those having square ends, and prevent them from revolving, a hook may be employed, either at the front end of the drill immediately behind the wood, or at the other end near the dead center, the shape of the

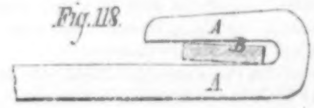


Fig. 118.

hook being as in Fig. 118. A A is the hook, and B the drill shown in section, and in the position in which it is held by the hook when in operation. The end, C, of the hook may be made to fit and be held by the tool post, or it may be made long enough to rest against the lathe rest saddle. It is as well to start the drill true with the guide, C, shown in Fig. 117, and, when the drill has entered, say to its full diameter for a quarter or three eighths of an inch in depth, to take out the guide from the tool post and insert the hook in its place, keeping it as near to the outer end of the hole as practicable.

Electric Fall Machines.

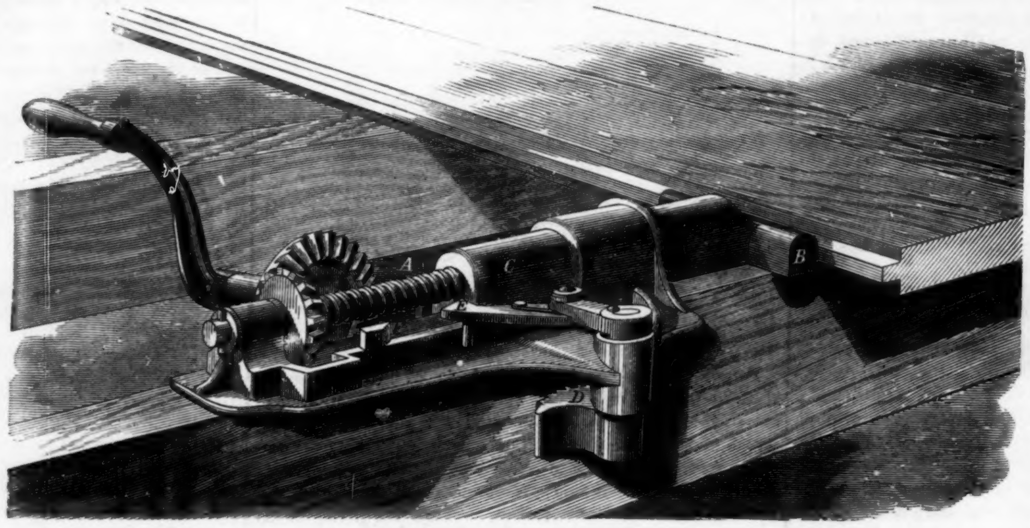
These are for demonstrating the laws of falling bodies. In one arrangement, a brass ball is hung by a thread some hight above the ground. Under it, at distance = 1, are two metallic balls connected with the poles of an electric machine; they are so far apart that a spark cannot pass between them, but if the suspended ball drop between them a spark will pass. Further down, at distance = 4, then = 9, etc., are similar pairs of balls. The thread of the suspended ball being burnt, the latter falls between the successive pairs, giving passage at each pair to the current, and simultaneously the spark in another part of the circuit strikes a revolving soot-blackened drum, making a mark. The distances between successive marks are found to be equal. In a second arrangement, there are two cylindrical conductors, insulated and vertical, with a metallic ball suspended between them at the top, hardly filling the interval, and sufficient to enable a spark to pass between the cylinders, which are connected with the poles of an induction (secondary) coil. One of the cylinders has a coating of soot-blackened paper. The thread is burnt, and the ball falls; sparks are made to pass at regular intervals of time, by means of clockwork, interrupting the battery current. Each spark leaves its mark on the blackened surface; and thus are shown the spaces passed over in equal times.—*M. Waldner.*

The Silk Harvest of the World.

According to a report, just published by the Syndicate of the Lyons Union of Silk Merchants, the silk crop of Europe last year was, in round numbers, 9,050,000 pounds of raw silk, while there were exported from Asia, 11,500,000 pounds, making upwards of twenty and a half million pounds of raw silk available for European consumption. The countries included in the report are Italy, France (with her dependencies, Corsica and Algeria), Spain, Greece, the Turkish Empire, Georgia, Persia, India, Japan, and China. The first and the last together supply four fifths of the silk used in Europe. China exported, chiefly from Shanghai, upwards of 8,000,000 pounds. The crop of Italy amounted to 6,300,000 pounds. France supplied 1,600,000 pounds: Spain, about 310,000 pounds; Greece, less than 30,000 pounds; the Turkish Empire, 1,180,000 pounds; Georgia and Persia, together 880,000 pounds; India (from Calcutta), 935,000 pounds; Japan, something over 1,200,000 pounds.

IMPROVED FLOOR CLAMP.

We illustrate herewith an improved floor clamp, which, by a single operation, is tightly secured to the joist while caused to push the flooring boards together. By a reverse proceeding, the pressure on the latter is removed and the joist clamp unfastened simultaneously. The device may be advantageously used for the clamping of doors, sashes, etc., as well as floors. It may be also employed as a lifting jack by placing it endwise on a suitable support.



WOOD'S FLOOR CLAMP.

A is the driving screw, which is rotated so as to cause the clamp, B, to move in or out by means of the bevel gear actuated by the crank handle shown. The screw works in the rear end of the straight piece, C, a nut being cut to receive the thread, and the interior being hollowed so as to serve as a shield for the screw. D is a toothed cam, the shaft of which is provided with a spring which throws the teeth against the side of the joist. The upper extremity of the shaft carries a short arm, and this, by a spring joint, is connected with the catch, E. The object of the spring in the joint last mentioned is to throw the catch inward, to the position represented.

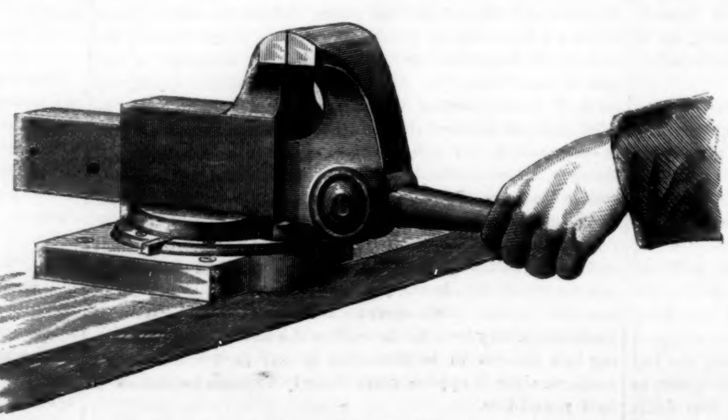
The mode of adjusting the device is clearly shown. On rotating the handle so as to drive the screw outward, thus pushing the boards together, the rearward motion which the apparatus first takes causes the cam, D, to be partially turned and its teeth to bite against the joist; so that the latter becomes tightly jammed between said cam and the stationary jaw on the opposite side of the bed plate. On reversing the motion of the screw, the straight piece, C, engages with the shoulder of the catch, E, and carries the latter to the rear with it, thus turning the cam shaft and so loosening the same. This continues until the catch strikes the inclined side of the stop, F, which pushes it out of engagement with the piece, C, when the catch is carried back by its springs to its former position.

It will be seen from the above that the device has the merit of simplicity both in construction and in operation. It is necessary only to place the apparatus in position and begin turning the handle at once, its automatic attachment and loosening saving the expenditure of time usually devoted to securing the clamp in place.

For further particulars address Mr. George William Wood, 3,412 North 19th street, Philadelphia, Pa.

IMPROVED SUDDEN GRIP VISE.

The improved form of parallel vise, a perspective and a sectional view of which are given herewith, is adapted to the uses of all classes of mechanics. It possesses the advantages of rapidity in action and of being able to clasp any sized piece of work within its capacity through the one motion of the hand. It has a self-acting swivel, which allows of its adjustment to any desired position, so that it may be used with the right or left hand with equal facility. The holding mechanism, as will be seen from the following description, is constructed so as to apply the power with great advantage, and the position of the handle is such that, while it is convenient to operate, it is turned out of the way of the workman after the jaws are caused to embrace the work. The various parts are interchangeable, and therefore, in case of injury or loss, easily duplicated; and finally, the castings and other portions are made with a view to the highest strength and durability.



HALL'S SUDDEN GRIP VISE.—Fig. 1.

From Fig. 1 the general appearance of the implement, and the mode of operating the lever which determines the movement of the jaws, will readily be comprehended. The interior mechanism is shown in detail in section in Fig. 2. B, in the latter engraving, is the stationary jaw through which the movable jaw, A, the straight part of which is cored out, passes. P is the bed plate, made in two pieces so as to be adjusted into the dovetail formed by the lower portion of the jaw, B. To retain said plate in place, a wedge, W, is driven in between the sections, spreading the same just sufficiently to make a neat fit with the jaw base. Above the plate, P, and held in front and rear by the lower portions of B, is a steel rack plate, H. The rear end of this is secured, and the entire plate prevented from rising by the screw, N.

The lever handle has cast, on each of the sides of its inner end, a disk. These disks are inserted in a socket in the outer extremity of jaw, A, and held in place by friction straps, T, which are adjusted to hold said disks loosely or tightly by means of the set screws, S. On the inner portion of the disks is a pin, K, which, when the lever is raised as shown, presses down the end of a pivoted bar, J, located inside the hollow jaw. Said bar thus raises the toothed clutch, G, and disengages the teeth of the same from the rack, H. Under these conditions, it will be seen that, by pulling or pushing on the handle, the jaw, A, may be drawn out or shoved in very easily, and so adjusted in contact with the work.

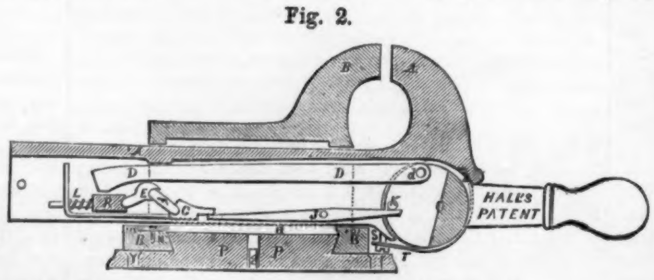
As soon as this last is done, the lever handle is pushed down. The effect is to release the lever, J, and so as to allow clutch, G, to drop, and also to draw a bar, D, which is pivoted to the handle disks, outward; and thus the end of said bar acts as a wedge to push down the toggle joint, E E, and so to force the clutch, G, forward, to act against the rack teeth. As the part, E, of said clutch bears against the bar, R, which is cast with the jaw, A, it is evident that, acting on the bar, R, as an abutment, the extension of the toggle joint tends to carry jaw, A, inward, with great force, and so to grasp the object inserted between the jaws very tightly. As soon as the lever is raised to loosen the work, the coiled spring, L, acting on the upward turned end of the clutch, G, carries the latter to the rear, and so removes it from the rack teeth, and, at the same time, returns the toggle joint to its normal position.

A moment's consideration will show that the tendency of the downward as well as rearward thrust of the toggle joint is to raise to the jaws. The screw, N, prevents the raising of the rack by the clutch teeth. The same downward action is also utilized to prevent the swiveling of the vise after the grip is put on. That is to say, as the lower portions of the jaw, B, embrace the bed plate, P, the latter acts as a center of rotation; but when the lever is carried down, the force of the toggle joint jams the above parts together, and prevents motion of the swivel.

The handle, when turned down, it will be noticed, is entirely out of the way of the workman, and is very quickly operated. The apparatus is secured to the bench by the screws, Y. In a later model of the vise than that represented, the base of jaw, B, is carried out to the edge of the bed plate, thus covering the heads of the screws, Y. A gate, in such portion, gives access to the screws, when the vise is turned so that the opening comes over each head in succession.

This implement gained the medal of progress and a diploma of honor at the Vienna Exposition, such awards being, we are informed, higher than those given to any other vise. It also took the highest premium at the Fair of the Franklin Institute in Philadelphia in 1874.

Fig. 2.



Patented in the United States, Canada, and in the principal foreign countries. For further particulars relative to sale of rights, etc., address Mr. Thomas Hall, 411 Fulton street, Brooklyn, N. Y., or Mr. Charles Parker, manufacturer, Meriden, Conn.

English Sugar-Cutting Machinery.

It is with sugar as with a great many other articles of commerce: the appearance of the goods, without any reference to its intrinsic quality, largely influences the sale. Sugar neatly divided into regular lumps, each one presenting a clean, crystalline, and brilliant surface, is certainly more attractive than a mass of fragments resembling bits of chalk; while the uniformity of the pieces renders its use much more convenient. The mode of cutting up the sugar, as practised in this country, is to saw the loaf crosswise into slabs, and then to stab the latter on both sides with a number of spikes, breaking the mass into fragments of varying sizes. A new apparatus, called Burton's diamond sugar-cutting machine, has lately appeared in England, which, according to the London *Grocer*, cuts the loaf into perfect forms with great rapidity. The machine, says our contemporary, stands above four feet high, is over six feet long, and about three feet wide. At one end, on a sort of platform, a man is engaged in placing the loaf of sugar horizontally, with its base pressing against the middle of the machine, where a circular saw, worked by steam power, cuts the loaf into slabs. These, being round, of course run by themselves on to a pair of rollers fitted with longitudinal knives, between which they are cut into splints or sticks. Much quicker than it takes to tell, these again, watched by a boy, pass down an inclined plane into grooves, and fall vertically from a smaller pair of knife rollers into a hundredweight box prepared to receive them. They are now quite ready for service on the table, and, surrounded by a blue paper lining, present an endless variety of sparkling cubes triangles, and diamonds, that can be dropped into the cup at a word to suit the different likings of tea and coffee drinkers. On each side of the box is placed a receiver, one for the fine pulverized powder that falls from the saw, the other for a more gritty substance that comes from the knives. Both are put into bags to be sent where they meet the freest purchasers. A more minute examination of the cut portion shows plainly enough that, while four sides glisten from the action of the knife, only two bear evidence of the marks of the saw; and such a result being the very reverse of that produced by the French *modus operandi*, it must be admitted that the new sugar cutter, in point of cleanliness, neatness, and rapidity, leaves scarcely anything to be desired. Just imagine a whole loaf being cut up entirely in about two minutes, which is at the rate of five hundred cwt. an hour, or three tuns in a working day of twelve hours, without stopping, and say if such a thing was ever known before! And the same engine that drives this machine can also be employed for grinding pepper, roasting coffee, cleansing rice, etc.

New Style of Telegraph Poles.

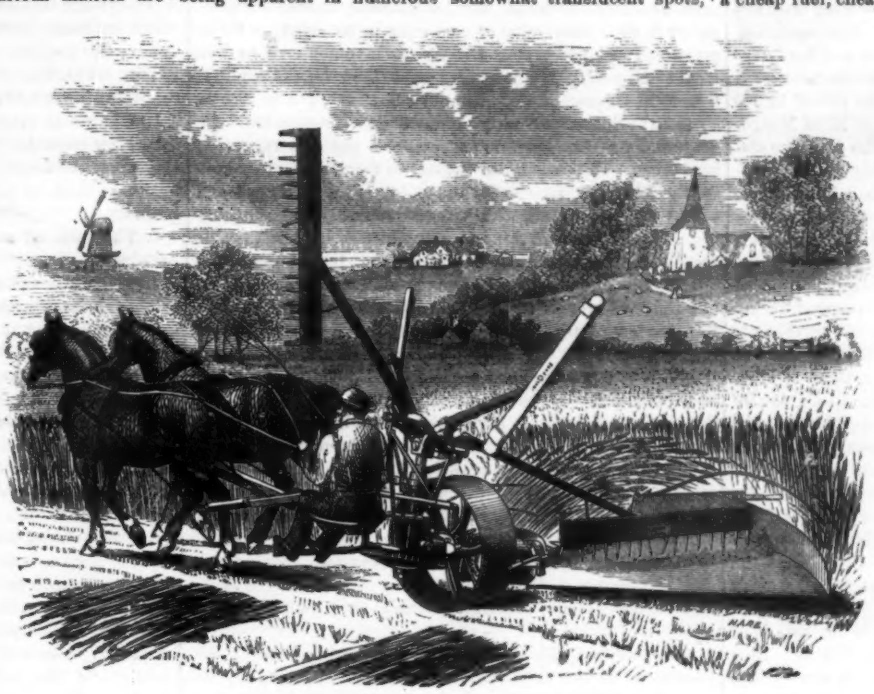
There has lately been erected at the junction of Broadway and 23d street, in this city, an example of a new form of telegraph pole, of iron. It is said to be lighter than a wooden pole of the same hight, stronger, and capable of supporting a greater weight. It is constructed of a number of wrought iron bars, rolled out the entire length of the pole, which bars are placed around light cast iron cores, arranged at proper intervals from each other. The cores have seats or notches to hold the bars in their places to prevent their moving sideways, and the bars also have notches, into which the cores fit to keep them from moving up or down. Around the outside, where each core is placed, a ring or band of wrought iron is tightly fitted, which holds the bars firmly in their places, and thus forms the whole into a light, open, and graceful column. Any number or any size of bars may be used, but it is found that six very light bars of angle iron arranged in this way afford a strength that fully meets that required for a telegraph pole of fifty feet in hight. The cores are large at the base and are made smaller as they approach the top, which gives the column a graceful taper, and the whole is surmounted by a suitable crosshead to hold the arms for the wires. Such a column is very simply constructed and is without a rivet throughout its entire length. No machinery or shop labor is required to put it together, other than the making of the outside rings or bands by an ordinary blacksmith, so that the pole may be ordered in pieces and put together at the point where it is to stand. The column is suitable not only for telegraph poles but for masts for iron ships, derrick masts and booms, stringers for bridges, lamp posts, and a variety of other purposes.

Pour preserves into jars and seal while hot.

NEW REAPING AND MOWING MACHINERY.

We illustrate below some improved reaping and mowing machinery manufactured by Messrs Burgess & Key, London, England. No agricultural machine has had so much attention devoted to its improvement as the reaper and mower—especially the former. The difficulties under which such machines have frequently to work, coupled with the necessity that exists that the work shall be done in the very best and simplest manner, render it no easy matter to design a proper machine; and each year sees some new improvement brought forward at one or another of the various agricultural fairs. Owing, therefore, to these progressive strides, many excellent machines by various makers are now to be obtained at no very extravagant outlay of cash. Machines of this type are now made more compact, lighter and stronger, and, moreover, the dangerous parts are better protected and fenced in.

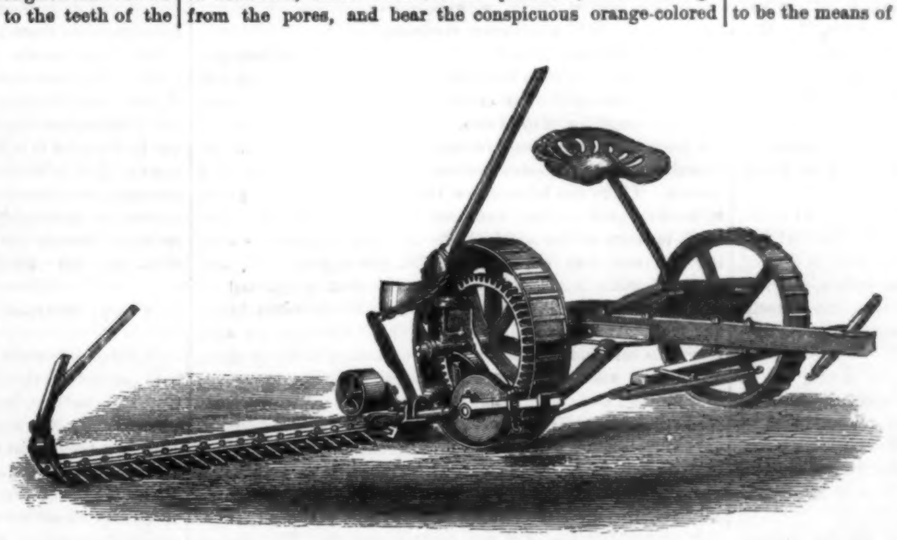
The reaper for home use shown in our first illustration is a strong two-horse machine, whose weight has been reduced down to 10 cwt.; the tyre of the main driving wheel is wrought iron and of extra width, which at once increases the driving bite and better sustains the machine in soft ground. The fingers, being open at the back, do not clog. The finger beam is made of rolled steel to combine lightness and strength, and the guide cam is so altered and improved as to bring the rakes closer to the ground, so as the better to deal with laid crops. The fingers, which of necessity are exposed to very severe and sudden strains, are now made of cold blast crucible iron, which is about the strongest description of cast iron to be had.



BURGESS AND KEY'S REAPER.

Our second illustration shows the reaper, in which increased simplicity and the substitution of wrought for cast iron have reduced the weight of the mower from 7¾ cwt. to 6¼ cwt., without reducing the strength, while the repairs bill is also reduced. The second improvement consists in giving the hinge shoe end of the cutter bar a greater space to rise and fall with the undulations of the ground, without disturbing the movement of the main wheel when it sinks in a furrow or in soft land. However carefully rolled, the surface will always present inequalities, therefore any provision to allow for them, such as the above, is of great importance. The cutter bar is provided with a wheel at each end, and the mechanism for elevating the knife is so designed that, by means of a compensating tongue and slide box, it is always kept parallel with the ground surface, and the fingers are thus kept from plowing into the earth. The method of lubrication is so designed that the oil applied to the bearings runs from them to the teeth of the gearing.

Another improvement is in the manner of jointing the knife to the connecting rod by means of a spring bolt pin. This pin secures itself, and no split pins, leather, etc., are needed; while any pressure of the thumb on the spring bolt at once releases the pin. A third improvement is in the method of inclining the fingers and recessing them so that the knife does not become clogged with dirt. In this mechanism, the crank shaft bracket not only secures the crank shaft bearings, but also the spindle of the bevel wheel, both bearings being bushed; and the bushes being the only parts that wear, they are easily and cheaply replaced in time of need. The bracket fences in the gearing and preserves it from dirt.



BURGESS AND KEY'S MOWER.

Paper Plants.

A good deal of interest has been excited by the recent reports on the paper-making grass of Algeria, the so-called *alfa* or *stipa tenacissima*, which covers hundreds of thousands of acres in that country. But the *Agricultural Gazette* of India states that another plant is to be introduced into Algeria, of still greater commercial value. This is the *hibiscus esculentus*, the use of which as a fibrous plant has long been recognized. The plant, though indigenous to the West Indies, has long been naturalized in India. Its pods produce the common vegetable known as ochro by the English, gomto by the French, chimtomo by the Spanish, and benditeai, in India, where it is so much esteemed for its mucilaginous thickening for soups. The pods are gathered green and pickled like capers. The seeds may be boiled like barley, and the mucilaginous matter they contain is both demulcent and emollient. They have also been recommended when roasted as a substitute for coffee. A patent has now been taken out in France for making paper from the fiber, and for this purpose it is to be introduced into Algeria. The fiber is prepared solely by mechanical means in a current of water, without any bleaching agent, and the pulp, washed and bleached, is reported to make a strong, handsome paper, equaling that from pure rags. It is called banda paper.

The Coffee Plague in Ceylon.

The Director of the Royal Botanic Gardens in Ceylon has just prepared a statement of the result of the latest investigations into the nature and development of the leaf fungus (*hemileia vastatrix*), which has for several years so affected the coffee trees of the island. He can report nothing to indicate its probable disappearance, or diminution of its intensity. Though requiring careful inspection for its detection, he unfortunately found it present upon all the coffee trees which he examined. With the help of a microscope, it is found at all times to pervade the greater part of the stem and older leaves in the form of very fine, branching filaments, its effect being apparent in numerous somewhat translucent spots, which may be observed by holding up one of the leaves against the light. The direct injury so caused to the coffee tree is, however, very slight as compared with the effect produced when the fungus attacks the young leaves, causing them to fall prematurely. As the presence of the fungous filaments in such abundance on the outer surface of the tree is amply sufficient to account for phenomena, which it was at first thought were attributable to a poisoning of the juices of the tree, by an absorption of the fungous matter through its roots, that idea must be abandoned, and the disease considered as external, except when it appears within the tissue of the young leaves. Subsequently, from these enclosed masses of filaments, short branches are produced, which emerge from the pores, and bear the conspicuous orange-colored spores, or reproductive bodies. Some of these spores have been observed to germinate on the outside of the leaf, producing branched filaments of exceeding tenuity, which grow with marvelous rapidity all over the surface of the leaf, and beyond it to the stems. The ends of some of these filaments, too, have been observed to enter the pores of the leaf, and there to form fresh plague spots and fresh crops of spores. It is to be hoped, now that the nature of the malady is better known and more accurately defined, that some effective cure may speedily be found for this disease, which is so greatly damaging the Cingalese coffee crop.—*London Grocer.*

Discovery of Another Grove of Great Trees in California.

This grove is situated in a basin at the head waters of the San Lorenzo and Boulder creeks. One of the trees eclipses all that have been discovered on the Pacific coast. Its circumference, as high as a man can reach, standing and passing a tape line around, is a few inches less than 150 feet. This is beyond the measurement of any tree in the Calaveras Grove. The hight is estimated at 160 feet, and a part of the top lying on the ground is over 100 feet in length. The other trees in the vicinity are not as large, but all are of immense girth.

A New Source of Fuel and its Utilization.

There is no doubt but that the cutting down of forest trees, simply for the sake of the wood as fuel, is a practice which cannot and should not be continued in any civilized country. The forests are far more valuable standing, inasmuch as their destruction, as we have repeatedly pointed out, involves climatic alterations and changes in the nature of soil which seriously affect agriculture. But the necessity for a cheap fuel, cheaper than coal, still remains; and probably until that want is supplied from other sources, no amount of warning and argument will confine people to using simply the dead wood and prevent their felling the growing trees. It so happens that there is a source for cheap fuel, which only waits for the invention of a means for its utilization. And this source is found in the grass which withers on the prairie, the seaweed which decays along the coasts, the dry leaves of the forest, and in all such vegetable refuse. If a quantity of straw, hay, or leaves be spread out in loose masses and set on fire, the result is rapid combustion; but if the same material be compressed into a solid bale or block, the combustion becomes little more than a gradual smoldering. It is hardly necessary to dwell upon these facts, since they are well known to every farmer who has transacted the slow burning of an old hayrick with the rapid ignition of the dry leaves, swept loosely together from roads and paths, and fired to get rid of them. In the latter case, there is a free draft through all the interstices of the mass, and hence an immense supply of oxygen; in the former the compression obstructs the draft, and checks the oxygen supply, and, as a necessary consequence, retards combustion.

It will naturally occur to the thoughtful reader at the outset that the needed invention must be one in the shape of a furnace in which the light materials may be burned in this compressed form. Western settlers have anticipated the idea by twisting straw and hay into ropes and burning the same during the long months of past winters, after the grasshopper devastations had deprived them of the necessary means wherewith to procure wood for their households. But this has proved but a partial solution of the difficulty, and the prairie grass ropes, though burning slower than the loose hay, are still consumed too rapidly to be of much advantage where a steady heat is required.

Whether a new invention which has recently appeared is to be the means of solving this important question, we are not prepared positively to state; but so far as the construction and principle of the same extend, it seems to be a valuable and ingenious device. It consists of a box of stove sheet iron, in which is a heavy press follower, which by simple mechanism can be moved up and down, and thus arranged to maintain a steady pressure upon the hay or similar material placed in the fire chamber. A feeder allows of the supply of fuel being kept constant, and there is apparatus for adjusting the grate relatively to the follower, according to the quantity of material placed between them.

It will be readily understood that, when the pressure is upon the fuel, the flame cannot act upon the mass either at top or bottom. Combustion, says the inventor (Mr. Alexander Hamilton, of Cresco, Iowa) can go on only around the sides to which the heat and air have access; so that the consumption of fuel is very slow, and can be easily graduated by the draft supplied. It is further said that one hundred pounds of hay or straw per day will be sufficient to feed the stove during the coldest weather, and that six or seven tuns of the material will suffice for an entire winter.

If the invention substantiates in practice the advantages foreshadowed, it will serve at least as a step in advance foward a most important utilization of a now wasted material, and at the same time it will accomplish such progress certainly in a mode much simpler than that involved in the majority of straw-burning furnaces now extant.

New Inoxidizable White Metal.

According to M. Marlié, an inoxidizable white metal may be made of iron 10 parts, nickel 35 parts, brass 25 parts, tin 20 parts, and zinc 10 parts. The alloy is cast and cut in pieces, and the latter are tempered at white heat in a mixture of sulphuric acid 60 parts, nitric acid 10 parts, muriatic acid 5 parts, and water 25 parts.

AN obdurate screw may sometimes be drawn by applying a piece of red hot iron to the head for a minute or two, and immediately using the screw driver.

Russian Metal Industries.

While Russia will not through her government contribute to the Centennial, for reasons about which there are so many contradictory rumors that it is difficult to assign any as the truth, there is a fair probality that through private enterprise her industries will make a display which will, in a measure at least, typify her enormous natural resources. In the United States, little is known concerning industrial progress in Russia, other perhaps than that the advancement of the same must necessarily have been rapid, in view of a great civilized empire to-day existing where, one hundred and fifty years ago, there was little more than a nation of barbarians. From the death of Peter the Great in 1725, Russian manufactures have steadily pushed onward, until now in several branches they enter into competition with those of far older countries.

In some districts the manufacture of cutlery and hardware forms the sole occupation of the entire male population. A kind of two-bladed pocket knife is made, at the rate of 10,000 dozen per year, and sold at the annual Fair of Nijni Novgorod. Locks and trunks manufactured in the Pavlovo district find their way all over Asia. Some thirty or forty settlements in the Pavlovo district make nothing but knives, scissors, swords, and various edge tools. There are two large firms which employ 600 men each. The raw materials are English steel and a native product obtained from the government works on the Ural River. A large portion of the Semenoff district is engaged in the manufacture of fishing tackle and metal bolting cloth for mills,and 40,000 scythes per year are made at the Artinsky works in the Zlatoust district of the Ural. The Russian edge tools differ from those of English make in many respects. The common spade, for instance, is made chiefly of wood and simply tipped with iron; it is of small size, rounded at the edge, and has a plain curved handle. The ax is much larger than those of western manufacture. In the hand of a Russian workman, it is used for all kinds of carpenter's work. It answers as a plane, and as a hammer; even as a saw, for the last very useful tool is rarely employed by the Russian mechanic. He can wield the ax more easily, and cut through thick logs of wood with incredible precision and rapidity.

Russian iron is now largely employed in the cut nail manufacture, a growing industry carried on near Moscow. Silesian and Swedish irons are made into telegraph wires. The manufacture of iron holds a very important position, although the quantity produced is insufficient to supply the demand; besides, Russia is unable to compete in the cheaper qualities of that metal, owing to the expensive process of using wood fuel in its manufacture, coal being rarely used. Sheet iron is produced to a great degree in large private establishments; but steel-making is yet in its infancy, the metal being made almost entirely by one or two government founderies; it is applied chiefly to the manufacture of cannon. Breech-loaders, introduced by the Americans and adopted in the Russian army, cartridges, and swords are manufactured also by government works.

Colonel Amosoff, of the Zlatoust Government Works in the Ural, has discovered, it is said, the secret of the ancient Damascus steel. The Russian imitation is a particular modification of cast steel of peculiar crystallization, which last character betrays itself through corrosion by acids (the process of bringing out figures on steel) by acting more violently between the interstices of the structure than elsewhere, thus tracing out the arrangement of the crystals. The sword blades are made to pass a test, being bent double and back again several times. A well tempered saber of Damascus steel will readily sever bars of iron and the most flimsy kerchief as it floats in the air.

Samovars are a leading article of the Russian metal trade. These are a kind of tubular boilers, with little charcoal furnaces, and are used for making tea. The material is copper, which is almost exclusively used among the well-to-do classes for cooking utensils. Tin ware, hollow cast iron vessels, and pewter are little employed. The peasants still eat with wooden spoons and bowls.

Harness fittings of European pattern are made, but in very limited quantities, those used upon Russian harness being of different construction. Horseshoes are produced by hand at the rate of 30,000,000 per year. Bell-making is carried on with especial success, the bells being remarkable for the immense size and richness of tone. This is one of the ancient industries of the country.

It may be said, *writes* a correspondent of the *Ironmonger*, to whose exhaustive letter we are indebted for the main facts given above, that Russian manufactured goods have for the most part attained a high degree of excellence; but many of them are enormously dear. The interests of the immense mass of the Russian people who consume are thus sacrificed to increase the wealth of the comparatively small class who manufacture. But it must be remembered that the greater number of iron-manufacturing consumers were only a few years ago in a state of serfdom.

Patented Car Improvements.

The mechanical requirements of railroads are a perpetual stimulus to invention. An unceasing demand exists for new or improved devices. The two great essentials of safety and economy are never so perfectly realized as to satisfy either the road managers or the public. The burden of nearly all the talk when engineering and mechanical associations meet for consultation is how to remedy existing defects by the use of better methods and appliances. This, with the inherent capacity of railways for development, offers an inviting field to inventors, which they have not been slow to cultivate. The consequence is that a multitude of inventions are pressed upon the attention of railroad men, some of which are intrinsically good and meritorious, while the vastly greater number are absolutely worthless. But so long as inventors persist in patenting the products of their ingenuity, railroads must pay for the right to use them, or not use them at all. A discrimination must also be made, in order to select such as are really valuable; and this can be done in no other way than by careful experimental testing, uninfluenced by the interests or claims of patentees.

The discussions of the Car Builders' Association at its last and previous meetings evince a sensitiveness on the part of some of the members in regard to the use of patented devices, which is not calculated to secure the advantages to be derived from them. The impression seems to prevail with some that such devices are not only inadmissible as legitimate topics of discussion, but that the many needed improvements in the construction of cars must be provided, as far as possible, without paying tribute to inventors. Now this would unquestionably be a very good thing for the roads, if it were at all practicable. There is, however, a very serious obstacle in the way of carrying out such a programme. Inventors, as a class, are no exception to the general run of humanity. They are quite willing to receive remuneration for the time and money they expend in getting up good and useful contrivances for making cars run easily and comfortably. If they have anything to sell which is salable, they do not blush to name a price; and they would just as soon make a livelihood out of railroad earnings as in any other way. It is purely a business transaction between buyer and seller. In this view of the case, it is evident that no very valuable improvements in the design and construction of cars are likely to be discovered and applied independently of patents and patentees. It would, therefore, seem to be right and fitting that all patented inventions for such purposes should be freely discussed by car builders at their yearly and monthly meetings, as the only way of ascertaining what is worthy of being adopted. Any practicable plan for better ventilation, any radical improvement in drawing and buffing attachments, brakes, framing, coupling, etc., must work a saving in expenditure, or augment the comfort and safety of passengers to a degree which will more than justify the cost of the right to use, or else such improvements are hardly worth a trial.

We are aware that there is a difficulty attending the discussion of the merits of rival inventions, or, indeed, any patented invention having relation to cars. If this, that, or the other device is approved or condemned, a suspicion is apt to be aroused that undue influences have been brought to bear, that somebody's ax is being ground, or somebody's fortune made or unmade, while others, equally worthy or unworthy, do not get what is their due. It is hardly possible that entirely disinterested action can be secured in such cases; but action of some sort cannot very well be evaded. It is obviously not the business of the Car Builders' Association to make or unmake the fortunes of inventors, or to discriminate between rival claims, except on the score of actual merit; but it is certainly bound to recognize inventions, and pass upon their respective merits, so far as the interests of railways within the limits of the car departments are affected thereby.—*National Car Builder.*

American Ordnance.

The low estimate placed by Europeans upon cast iron as a gun metal has not been fully concurred in by American officers, who have made it a subject of investigation and careful experiment for many years. Since 1840 a steady progress has been made in the improvement of its qualities, and the experiments of Wade and Rodman in this direction are well known. There can be no doubt that the American gun iron is the strongest and best cast iron made in the world. The mean tenacity of the metal of the 15-inch guns made during the war was about 36,000 lbs. per square inch, and in some cases reached 40,000 lbs. The iron is smelted in small charcoal furnaces with cold or moderately warm blast, and from pure rich soft limonites. The crude pigs are subjected to one and sometimes two preliminary meltings in an air furnace with sand bottom. The guns for the army are cast hollow, and cooled from the interior by a water core, while those for the navy, with the exception of the 15-inch, are cast solid. A wood fire is kept up in the pit for several days during the cooling. The water core is at length removed, and water is circulated in the naked bore until the gun is quite cold. The initial tension thus produced is considerable, though in very rare cases excessive. The degree of tension is determined by cutting off an annulus from the sinking head or muzzle and planing a radial cut. Just before the cut has passed through the annulus, the ring snaps, and the amount of gape gives the relative tension. Guns which do not conform to the requirements of these tests are rejected.

The only gun in the United States service upon which much reliance has been hitherto placed, and which is capable of really heavy work, is the 15-inch smooth bore. There are innumerable smaller guns mounted along the sea coast, but they are each considered as a *locum tenens* awaiting a heavier armament. While the 15-inch smooth bore is very far inferior to a 10-inch rifle in range and in penetrating power against heavy armor, it is by no means an insignificant weapon. This gun was designed in 1867 and 1868 to fire a maximum of 50 lbs. of powder and a 350 lb. shell, but its present charge is a solid shot of 450 lbs., with a maximum of 120 lbs., and a service charge of 100 lbs., of powder. The muzzle velocity with the heavier charge is about 1,700 feet, with the lighter about 1,590 feet, while the corresponding pressures, as recorded by a Rodman internal gage, are 21,000 lbs. respectively.

This great increase in power points of course to a great improvement in the means of controlling the action of the powder. Experiments upon gunpowder have been very numerous and thorough in the United States indeed we may say that that country is not behind any other nation in this respect. From the experiences gained, the experimenting committees have settled quite definitely for the present the gunpowder which will be used, and with the results obtained they appear quite satisfied. We are not at present in a position to publish the exact details respecting the powder recently adopted into the service, but we may state in general terms that the new powder is a large pellet consisting of two truncated hexagonal pyramids, base to base. They are pressed into this form between bronze plates which contain cavities, corresponding to the truncated pyramids, arranged in honeycomb fashion. The powder comes out in large sheets, which are easily broken up into pellets. There is nothing in this particular form of pellet, except that it is the most convenient for making, easily and cheaply, a powder which fulfils the following conditions:

1. The grains must be of sensibly uniform size and shape.
2. They must be homogeneous in respect to density; not only must the density of each and every grain be the same, but there must be no hard and soft portions in any single grain.
3. The ratio of surface to mass should be as small as practicable
4. All angles should be as obtuse as possible.

This shape of grain apparently fulfils the foregoing requirements better than any other which has been devised, excepting possibly the prismatic, to which, however, it appears to be equal, and is certainly cheaper and more convenient to manufacture. It is called the hexagonal powder, and its most satisfactory features are very low pressures with good velocities and remarkable uniformity of action. In the 15-inch gun the variations of pressure are not worth mentioning, and under the constant pressures of 15,000 lbs., or even 20,000 lbs., the endurance of these guns would be practically indefinite. The Rodman internal gage for recording pressures is exclusively used in the United States, where it is much preferred to Noble's crusher. The latter, indeed, appears to be strongly condemned among the artillery officers of the United States, although they are fully alive to the imperfections of the former. The gage ordinarily used consists of the well known cutter placed in a cylindrical steel box, the piston rod being exposed by a hole in the cover The whole is tied to the bottom of the cartridge bag, and buried in the powder. It is usually left in the bore after the discharge, or drops in the sand a yard or two from the muzzle. Sometimes the external gage is used in connection with it, and, notwithstanding the prevailing belief to the contrary, the two gages show a very reasonable agreement.

In consequence of the increased powder charges employed, buffers have been introduced into the American carriages, for the fifteen inch gun with 100 lbs. of powder is very lively on its carriage. For some years a pair of cylinders fixed to the front end of the chassis have been employed; they are a little less than 8 feet long and 13 inches diameter, and the recoil pulls out the piston rods compressing the air in the cylinders. They work very well, but are bulky and costly, and experiments are being made with hydraulic buffers, similar to those in use in this country.

The instruments for recording velocities in use in the United States are the Schultz and Boulengé's chronographs, the one most frequently employed being the former. This (the Schultz) instrument has been almost abandoned in Europe but in America it is supposed to have failed here through want of skill in its use, for when well handled it is a very superior instrument. United States' artillery officers have become so thoroughly accustomed to it that they generally prefer it, though the Boulengé and Benton chronographs are often used for "rough and ready" work —*Engineering.*

Useful Recipes for the Shop, the Household, and the Farm.

[We desire to state that the recipes which are given herewith, as well as those which have appeared in our columns from time to time, are not vouched for by us as absolutely correct, since it is manifestly impossible for us to submit all or even a fraction of them to the test of personal experience. They are selected, however, with much care from a wide and reliable range of sources, both domestic and foreign. Many are kindly furnished us by correspondents, and such we are especially gratified to receive. In this connection, we beg again to remind our readers that our columns are always open to them for the publication of such results of their own observation and experience as they may be pleased to communicate. We cannot repeat old facts, nor present trivial ones, but there is hardly a person who may read these lines who cannot send some hint or suggestion, sure to be new and valuable to some one else. Never mind the writing or the spelling; send us the bare facts, and thus pay off the moral debt owing to those who have already contributed their knowledge for your benefit. We intend this column of recipes especially for such suggestions; and if every one of our subscribers will but contribute one good fact a year, a volume of this paper will contain 45,000 recipes and valuable suggestions, not obtainable in books or from any other source.—Eds.]

Yellow stains commonly called iron mold are removed from linen by hydrochloric acid or hot solution of oxalic acid. Wash well in warm water afterward.

To fasten emery to leather, boil glue very thin, add a little milk, raise the pile of the leather, and put on the glue with the brush. Then sprinkle on the emery, and let it cool.

To preserve soap grease, fill a cask half full of good strong lye and drop all refuse grease therein Stir up the mixture once a week.

The best fattening material for chickens is said to be Indian meal and milk.

A remedy for caterpillars, which is used on a large scale in France, consists in a solution (1 part in 500) of sulphide of potassium, sprinkled on the tree by means of a band syringe.

The best and most durable insulation for electric wires is to tin them and cover with pure rubber.

Javelle water, used for turning white the dirtiest linen, and removing stains, is composed of bicarbonate of soda 4 lbs., chloride of lime 1 lb. Put the soda into a kettle over the fire, add 1 gallon of boiling water, let it boil from ten to fifteen minutes, then stir in the chloride of lime, avoiding lumps. Use when cool. This is good for removing fruit stains from white underwear.

Biborate of soda dissolved in water, used as a lotion, will remove prickly heat.

The average yield of corn cobs is 7·62 parts of carbonate of potash in 1,000 parts of the cobs, which is nearly twice as much as is furnished by the best specimens of wood. The corn crop of this country will supply 15,400,000,000 lbs. cobs, from which 115,500,000 lbs. of potash might be made.

The way they boil rice in India is as follows: Into a saucepan of 2 quarts of water, when boiling, throw a tablespoonful of salt: then put in 1 pint rice, previously well washed in cold water. Let it boil 20 minutes, throw out in a colender, drain, and put back in the saucepan, which should be stood near the fire for several minutes.

Save the corn cobs for kindlings, especially if wood is not going to be plentiful next winter. To prepare them melt, together 60 parts resin and 40 parts tar. Dip in the cobs, and dry on sheet metal heated to about the temperature of boiling water.

Equal weights of acetate of lime and of chloride of calcium, dissolved in twice their weight of hot water, is a fireproofing mixture for fabrics.

The ammoniacal solution of oxide of nickel will dissolve silk; that of copper dissolves cotton also.

[For the Scientific American.]

THE CHEMICAL FIRE-FLY.

BY PROFESSOR C. W. WRIGHT.

Of all the elements, there is none which presents such a diversity of forms as phosphorus, and not one that presents such a variety of properties which are so apparently contradictory. The number of allotropic forms assumed by this element, and the peculiar part which it plays in the conditions essential to the manifestation of sensation and intelligence, together with the fatal effects which often result from its introduction into the system, give it an interest not exceeded by that of any other form of matter whatever. A distinguished professor of this city, who was in his day a most attractive teacher, maintained that the chief element of success in a lecturer consisted in the power to address the eye, experimentally when possible, and by a well drawn mental image when the subject under discussion did not admit of physical demonstration. In other words, he contended that nothing should be left to the imagination of the student. There can be no doubt that a single, well selected experiment, skillfully executed, is more instructive than an hour's talk without illustration. Phosphorus may be selected as a means of illustrating the two methods of presenting a subject. Thus, the average text book informs the reader that phosphorus is luminous in the dark, or, in other words, phosphoresces when exposed to the air; and this is about all that is stated in reference to a property of this element, which is the most important of any connected with it. Upon this property, or one closely allied to it, is the poisonous quality of this agent based. Destroy this power of phosphorescence, and this element is no longer a deadly poison, either when swallowed, or by the action upon the bones of the upper and lower jaw. The phosphorescence of this element is accompanied by the development of ozone, and any substance which has the power of destroying ozone will arrest the luminosity of phosphorus, and, what is of still greater importance, destroy its poisonous action. In fact, phosphorus is not of itself a poison, but the ozone which it has the power of developing out of the oxygen of the air is the sole cause of the fatal results which follow its introduction into the system. This I have repeatedly demonstrated by experiments on the lower animals; and in two cases of accidental poisoning in human beings, the same facts have been proven. This is a subject, however, that properly belongs to the medical profession, and I will simply state that ten or fifteen drops of spirits of turpentine, mixed with an ounce or two of sweet oil, or any liquid fat, will prove an efficient antidote to elementary phosphorus, or any substance, such as the tips of matches or certain rat poisons, with which it may be incorporated. Other volatile oils, such as sassafras, may be employed when turpentine is not at hand. It is not every specimen of turpentine that will prove antidotal to phosphorus. Any substance that has the power to instantly destroy the luminosity of this body will prove effectual as an antidote; and the only assurance we have of the efficiency of any agent is to test it beforehand.

Phosphorus is, then, not of itself capable of producing inflammation of any tissues of the body; but ozone, which it has the power of evolving from the oxygen of the air, is the cause of all the local mischief which results from its contact with certain parts of the body. That this body may produce certain general effects when it finds its way into the circulation, we do not doubt, but these are distinct from its local action.

To prepare the chemical fire-fly, by which some of the most characteristic properties of phosphorus can be demonstrated, select a two ounce phial which has been well annealed, and introduce into it sweet or almond oil, till the bottom is covered to the depth of half an inch (lard will answer, if nothing better can be procured), and to this add fifteen or twenty grains of phosphorus, and then cork it loosely. After this, place the phial in a pan of cold water, and set it on a stove or other warm surface til the phosphorus melts, then shake the phial till the oil has dissolved as much of it as it is capable of holding in solution. Three or four vigorous shakes in the course of ten minutes will answer. That quantity of oil will not dissolve the whole of the phosphorus, which is not desirable. The cork must not be a closely fitting one, but must be forced into the phial so as to nearly prevent the escape of the oil when inverted. It is best to give the cork more of a conical shape than those in use by druggists. When experimenting, the phial must be warmed about as hot as the hand can bear, and slightly agitated or inverted, taking care, when doing this, to have the cork well secured; it may afterwards be loosened a little. When the cork is properly adjusted, which can be easily accomplished by a little practice, the whole interior will light up every few seconds, in rhythmical succession, and continue to do so for hours, provided the proper temperature is maintained. At the conclusion of the experiment, the apparatus should be put away in a dark place, and a tightly fitting cork introduced into the phial. A number of these phials, properly adjusted in a darkened room at different points, and several set swinging by means of strings suspended from the ceiling, produce a singular and weird impression, that grows upon the observer the longer the experiment is observed; and after a time it is difficult to divest oneself of the idea that the light is evolved by a living, moving creature. For impressiveness, there is no experiment in chemistry that makes such an enduring image upon the observer. Of course every precaution should be taken to avoid breaking the apparatus or spilling the oil. No damage, however, need be apprehended provided the directions are strictly followed. In experimenting with phosphorus, the inexperienced should always be provided with a large vessel of water in which a few drops of turpentine have been diffused. When burning phosphorus has been extinguished by this water, there is little or no danger of its re-ignition, which is very apt to occur when it is extinguished in the ordinary way. The phosphorescence of this element, when a solution of it is spilled upon any object, as well as its disagreeable odor, are instantly destroyed by a small quantity of turpentine suspended in water.

Under no circumstances should children or careless persons be permitted to experiment with phosphorus; not that it is anything like as dangerous as coal oil and many other articles handled daily, but there is no substance that so completely demoralizes the understanding, in case of an accident, as this.

The glow-worm may be imitated by transmitting bubbles of air through glass tubes containing the phosphorized oil. In fact, there is no end to the number and variety of experiments that can be devised by a person of inventive genius.

The phosphorescence of the fire-fly and glow-worm is due to slow combustion or oxidation; and the phenomenon is arrested in them, as it is in phosphorus, by placing them in a negative gas, such as nitrogen, for example. Phosphorescence is not always, however, the result of oxidation. This fact can be demonstrated by exposing the diamond to direct sunlight for a few minutes, and then transferring it to a darkened room, when it will emit a beautiful light for several seconds.

The phosphorescence of the fire-fly is not due to the slow combustion of phosphorus, nor is it an amatory display on the part of that insect. The species are perpetuated under different circumstances, and in the daytime. The fire-fly is a carnivorous insect, and the object of the illumination is to attract small insects, which are quickly devoured.

If the ear be placed near the vessel of phosphorized oil at the moment of illumination, a slight hissing noise will be perceived, produced by a sudden rush of air into the phial, in consequence of the partial exhalation (one fifth) of the air in the phial, by the abstraction of oxygen, which unites with the phosphorus. This fact is instructive. It demonstrates to us, in a striking manner, that a vessel which may be impervious to a liquid may permit the entrance or exit of a gas or vapor; and it accounts for the decomposition of spirits, conserves, extracts, etc., that are put up in vessels that are supposed to be hermetically sealed, simply because they do not permit of the escape of their liquid contents.

Louisville, Ky.

Progress of Flying Machinery.

A new steering balloon by Smitter is being exhibited, suspended in the middle of the Alcazar in Paris. The measurement is only 6,000 cubic feet, but the balloon is so light that, when filled with pure hydrogen, it must float. A considerable sum of money has been invested in it, and great ability has been displayed in the construction. Although no practicable result in open air may be hoped for, it is a wonderful piece of clockwork. In connection with this subject, it is stated that, for several months past, a firm of engineers have been experimenting privately at the Crystal Palace with an aerial steamer of a novel and promising character, weighing 160 lbs. Experiments are stated to have proved the capability of two vertical screws, each 12 feet diameter, to raise a weight of 120 lbs.; the steam engine, with water and fuel, forming part of the weight so raised to the extent of 80 lbs. The power exerted by it is equal to two and a half horses. The communication of motion is given by a vertical axis emanating from the car.—*Nature.*

Recent American and Foreign Patents.

Improved Dumping Car.

Benjamin Slusser, Sidney, Ohio.—This invention makes a considerable change in the frame of a dumping car or wagon, so that the contents may be discharged with little expenditure of manual force, and yet with great facility, the tail board being made to open automatically.

Improved Fifth Wheel.

Jacob Hodge, Springfield, Ill.—The fifth wheel is a circular iron disk, the face of which is slightly convexed, and which has lugs formed upon its sides to receive the clips, by which it is firmly secured to the axle. In the center of the disk is formed a hole to receive the hub on the circular disk of the head block. The lower side of the head block has a circular recess to fit upon the fifth wheel, the face of which is slightly convex, so as to bring the bearing toward the center. Upon the head block is a transverse rib, upon which rests a spring. Upon the rear side of the head block are formed two flanges, and an arm or projection, having slight flanges formed upon its side edges to form a seat for the reach, the forward end of which abuts against the rib of said head block. The connection between the reach, head block, fifth wheel, and axle is strengthened by two metal straps.

Improved Gas Generator.

James C. Mitchell, Lancaster, N. H.—This invention relates to certain improvements in the manufacture of illuminating gas, designed to utilize any kind of fuel for the production of the gas, and applicable to limited manufacture, as for private families, etc. It consists in a retort placed within a furnace, or a common stove if desired, and having an airtight door of peculiar construction, and a communication direct with the furnace, by means of which construction the gaseous contents of the retort may be drawn into the furnace and burned, when the airtight door is to be opened for drawing and recharging the retort. It also consists in the combination with the feed pipe to the gas holder of a ball valve to prevent back pressure.

Improved Cotton Chopper.

Wm. D. Evans, Society Hill, S. C.—The invention consists in a rotary chopper having intervaled sets of knives on two drums arranged on a single shaft, so as to chop out two rows simultaneously.

Improved Egg Tester.

Wm. W. Wilson, Parkville, Mo.—The invention consists in an egg tester consisting of a case in whose center is placed a lamp, and in whose side is a horizontal tube having an egg-holding cap at the outer end.

Improved Gang Plow.

A. Schrader, Walla Walla City, Wash. Ter.—The invention relates to that class of gang plows whose frames are supported on swiveled castor wheels so as to regulate the depth of furrow, and consists in an improvement by which the front and rear wheels are simultaneously graduated by the driver, so as to determine the exact depth of furrow required.

Improved Post Hole Borer.

Obadiah Love, Saxenburg, Pa.—The object of the invention is to expedite and diminish the cost of post-hole digging by making the blades form a cage, tapering in an upward direction, and causing the soil to crumble and discharge itself.

Improved Automatic Car Coupler.

F. W. Nash and S. S. Kirk, Washington, D. C.—This coupler is adjustable to any car, and couples with any other coupler, by simply bringing the cars in contact. It can be uncoupled from side, top, or platform of car, avoiding the necessity of the attendant ever going between cars. It is claimed to combine simplicity, utility, durability, strength, and cheapness. For further particulars, apply to S. S. Kirk, Washington, D. C.

Improved Vehicle Tongue Support.

George W. Burnside, Prairieburg, Iowa.—By suitable construction, when the draft is applied, the downward pressure of a chain upon a pulley raises the tongue, and supports it, so as to relieve the horses' necks from its weight, and hold it raised so long as the draft strain is continued.

Improved Foot Treadle.

Daniel E. Lillis, Lockport, N. Y.—The invention relates to the construction of swinging foot treadles for sewing machines and others, in which an adjustable foot plate is bolted on to the hanging bar, for shifting forward and backward on the bar to balance the feet relatively to the pivot. Ribs are cast on the edges of the foot plate, in combination with the notched hangers, to assist the binding screw in holding the foot plate fast.

Improved Lamp Fount.

Edward Brown, New York city.—The lamp fount is provided with a thin circular outwardly and downwardly projecting flange around an inner conical cavity, a space being left between the flange and body of the fount to receive the fastening screw of a bracket.

Improved Bessemer Converter.

Almon S. Dunning, Joliet, Ill.—The invention consists of a converter, the nose of which is constructed at the front part in straight or flattened shape. By the removal of the projecting angle or curved convexity, the sectional area of outlet is greatly increased, and consequently the force and velocity of the blast diminished. Thus any metal rolling up will fall back. The invention states that he has made about twenty thousand tuns of steel under this improvement, and with not one fourth the usual overflow.

Improved Harrow.

Joseph Rioth, Mount Sterling, Ill.—The harrow frame is made in two parts. Each part consists of three or more parallel bars, connected. The two parts may be adjusted closer together or farther apart, as may be desired. The outer ends of the outer bars of each part have rings secured to them. To the draft bar are attached five staples. Two draft chains, the forward ends of which are hooked into two of the staples, are equally distant from the center of the draft bar. The chains are passed through forward rings, and are hooked into rear rings, or are turned back upon themselves and hooked into their own links. The draft may be applied to the other side of the harrow. By detaching the chains, the parts of the harrow may be folded together, so that it may be drawn upon its side in passing to and from the field.

Improved Blind Stop.

Charles E. Steller, Milwaukee, Wis.—This consists of a plate of metal, arranged between the inner edge of one of the stiles of the blind and the end of one or more slats, so as to oscillate a little. It has a cam button on the style, so combined with it that, by turning the button against the plate, the latter will be pressed against the slats, so as to hold them by friction in any position in which they may be set. It was fully described and illustrated on page 70, current volume of this journal.

Improved Combined Grave, Coffin, and Monument.

Leland M. Speers and Abraham Clark, Newberry, S. C.—This device is so constructed as to prevent the escape of odors and the entrance of water, while allowing the features of the dead to be viewed whenever desired. The invention consists in a combined grave, coffin, and monument, formed of the recessed lower part, the grooved cover made thicker at its head end, and having an opening formed through it, in which is cemented a glass plate and the cover for said opening.

Improved Blind Stop.

Thomas T. Duffy, Dubuque, Iowa.—By suitable construction, by turning a rod, a cord will be wound upon the said rod, and the slat rod will be drawn down, opening the slats to any desired extent, where they will be held securely by a ratchet wheel and pawl. By withdrawing the pawl from the ratchet wheel, the elasticity of a spring will raise the rod and close the slats.

Improved Stove Grate.

Jonathan Moore, Jr., Brooklyn, N. Y., assignor to J. L. Mott Iron Works, New York city.—This is a combination of a laterally shaking and dumping bottom section, provided with clinker-breaking points, with the stationary top section, also having breaking points.

Improved Smoking Pipe.

Carl J. Jonasson, Warren, Pa.—In this smoking pipe the stem may be readily folded down to the bowl, so as to occupy a small space in the pocket, be less liable to get broken, and easily taken apart for being cleaned. The stem is hinged by ball and socket joint and connecting link.

Improved Flower Pot.

Joe Sephus Johnson, Somerville, Tenn.—This is an earthen flower pot consisting of body, hollow base, and perforated partition, all made up in one piece. With this construction the earth will be kept properly and uniformly moist, and will not be soaked or leached, as it is liable to be when the plants are watered by pouring water upon the earth in the flower pot.

Combined Cigar Tip Cutter and Watch Charm.

Emil F. W. Eisenmann, New York city.—The invention consists of the combination of a watch charm with a cigar-tip-cutting device. The stem end of the cutter is guided in the barrel in such a manner that, in pressing on the same, the cutter is carried down between the rims and cuts off the tip.

Improved Seed Planter and Fertilizer Distributor.

David F. Balentine, Mount Gallagher, S. C.—An arm projects into such a position that it may be struck by pins attached to a wheel. In the bottom is an opening for the seed to escape, which opening may be partially covered to regulate the amount of seed discharged by a plate. To the hopper is attached a narrow bar, the rear edge of which projects into the said hopper, and has saw teeth formed upon it to take hold of the seeds or fertilizer as the bottom rises, and cause them to pass out through the opening in said bottom. By this construction the bottom will be constantly moving up and down, keeping the seed or fertilizer in the lower part of the hopper loosened, and causing it to pass out regularly.

Improved Egg Box.

William H. Holdam, Crab Orchard, Ky.—The device consists of a box, having detachable egg holders, provided with subjacent spacing and supporting end pieces, so that each may be conveniently placed on a floor or table, and filled with eggs before being inserted.

Improved Vehicle Wheel.

Sobieski L. Bond, Columbia, S. C.—A nut screws on the outer part of the hub, against keys under the spokes, to wedge them out for tightening the tyre. The face plate screws on the nut against the sides of the spokes, to wedge the latter firmly in the mortises of the hub. There is a wedge between the ends of the felly, and a screw for drawing it up to fill up the opening made by wedging out the spokes and tightening the felly. The wheel can thus be tightened up as often as required merely by turning the screws with proper wrenches.

Improved Stove.

James L. Robarts, Brunswick, Ga.—This invention consists of a flue on the under side of the top plate of the stove, for carrying the heat around directly under the pots in a continuous stream, so as to heat them more, and quicker, and the other parts of the stove less, than with the common arrangement. It also consists of two openings in the bottom of the stove, making a passage directly through t for cleaning out the soot.

Improved Smelting Furnace.

Henry C. Creal, Cheyenne City, Wyoming Ter.—The ore melting furnaces are located one on each side of a central heating furnace, and communicate therewith by means of openings in the vertical side walls. The three furnaces, together with the flue, are arranged in the form of the Latin cross. Fire places located directly under the floor communicate directly with central fire place. The ore to be melted is placed on the concave floor of the side furnaces, and the same is melted by the heat from the central furnace and the fire places. The products of combustion from the side furnaces pass into the central furnace by means of the openings in its side walls, and, mingling with the products of combustion in the latter, pass to the chimney.

Improved Jar Lifter.

William W. Brower, New York city.—This is a jar lifter consisting of two rods made adjustable at the point of intersection, and bifurcated below, forming legs, which carry rubber-faced arc jaws made fast to the inside of their lower ends.

Improved Chuck for Rock Drills.

Joseph C. Githens, New York city.—A key is fitted into a groove in the piston rod. The inner edge of the key has a half-round groove formed in it, to correspond with the bottom of the groove in the piston rod, so that when the key is in place a cylindrical hole will be formed to receive a bit. The key has a swell formed upon the outer side of its middle part, which is notched transversely, to receive the bend of a U bolt, the arms of which pass through the enlargement of the piston rod upon the opposite sides of the groove in said piston rod, and have nuts screwed upon their ends. By this construction, the end parts of the key bearing upon the bit and the U bolt grasping the middle part of the key, there will be a slight yield or spring to the key, which will cause it to hold the bit more firmly.

Improved Car Coupling.

Charles E. Ramage, Sherman, Tex., assignor to himself and Wilhelm Heyde, of same place.—When the cars come together for coupling, the end of the link strikes an arm, which raises the other arm and the coupling pin. The link passes into the drawhead beyond the pin, the arm struck slips off the link, and the cars are coupled automatically. An angle plate is attached to the front of the car directly above the drawhead, and acts as a spring. Devices are added so that when the car runs off the track, and is partially turned over, the drawhead will be withdrawn from the car.

Improved Device for Regulating Car Ventilators.

George W. Birmingham, New York city.—The operating lever is fulcrumed to a supporting bracket. The opposite arm is jointed by a pivoted link to the pivoted ventilator. The central part of the lever bears against a brake spring attached to the ventilator frame, and is held by the friction of the same firmly in any position.

Improved Airtight Can.

Stephen Joyce, New York city.—The cover is made of two parts soldered together. In one part a groove is made, in which groove is a band of rubber which projects outward, and when forced down it is crushed and expanded by its contact with the flaring end of the can. The joint is made air and water tight. Ears left on the top of the flare are, when the cover has been forced down airtight, bent over the edge of the cover, so as to securely fasten and keep the cover in place.

Improved Portable Boiler.

George F. Johnson and Daniel Wilde, Washington, Iowa.—A barrel is hung on gudgeons in a kind of wheelbarrow. It is open at the top, and in the center of its bottom is a galvanized iron cylinder. In the lower part of the cylinder is a grate. To the upper end of the cylinder is attached a cover, and in the cover is formed a hole for the escape of the smoke. The grain or other feed to be cooked is placed in the barrel around the stove, so that it may receive the full heat of the fire. A conical shield is placed around the cylinder to keep clothes, when the same are boiled in the barrel, from coming in contact with said cylinder. To the shield, a little above its lower end, is attached a perforated flange, which projects nearly to the sides of the barrel, to keep the clothes up from the bottom.

Improved Fire Place.

William Tweeddale, Brooklyn, N. Y., assignor to J. L. Mott Iron Works, New York city.—This fire place is composed of a back plate inclined forward at the top, forward and outward at the sides, and provided with an opening to the chimney, and flanges which support the middle plate and damper. The middle plate is inclined forward at the sides and top, and provided with an opening also to the chimney. The front plate is secured to the middle and back plates.

Improved Pitman.

John R. Taylor, Eagle Point, Ill.—This is an improved pitman connection for connecting the driving power with the sickle bar of mowers, reapers, and harvesters, so constructed as to enable the wear to be taken up at the pivoting and working points.

Improved Metal Cap for Posts.

John Davenport, Stamford, Conn.—The metal cap is made in two parts, and secured by bolts being inserted from the under side of a flange, forming a cornice. The nut is confined by a lug cast on the inner wall. The upper part overlaps the lower part, so as to prevent the rain from getting inside.

Improved Paddle Wheel.

James Salter, Brooklyn, E. D., N. Y.—This invention consists of paddles composed of entire plates the whole length and breadth, with taper-pointed outer ends connected to a thin metal ring, and the inner ends connected to the hub. By the tapered form the paddles enter and leave the water much easier and smoother. The invention also consists of the paddles made in two plates, which match at the inner edge with an arm having a groove on opposite sides, in which the plates are confined by a band of metal applied between the rim and the hub, to fasten them to the arm, while the inner ends enter mortises in the hub.

Improved Leather Belting.

Charles H. Alexander, Henry W. Alexander, and Edward P. Alexander, Philadelphia, Pa.—It is proposed to cut the hide along the middle for belts of two or more plies, and turn the back edges, that is, the edges formed by so cutting it, outward, and the side edges inward; and for belts too wide to be made by the two pieces so cut, one or more middle pieces are introduced, taken from the center of a side. Thus the firmest texture is placed at the edges of the belt, and the softer and more yielding texture in the middle, which makes the edges hug the lower portions of the face of the pulley, while the middle stretches over the crown, and thus the belt acts with due effect throughout its whole breadth.

Improved Show Case.

William B. Smith, New York city.—When the door is closed, a cleat inside the bottom strikes the lower edge of a rubber, and turns it up and confines it against a rabbet, and thereby excludes all dust from the show case.

Improved Harvester Cutter.

Thomas R. Arnold, Knoxborough, N. Y.—In the back of the cutter bar is a groove, and on the side of the knives is a lip. This lip rests in the groove, while the knife rests flat on the face of the cutter bar. The knives are brought in contact with each other on the front of the cutter bar. The backs of the knives rest against the shoulder of the cutter bar, so that the knives are kept rigidly in place. The clamping bar is attached to the cutter bar with screws which pass between each pair of knives. The corners of the knives, having corresponding pieces cut out of each corner, form rearwardly opening spaces on each corner edge of the shank. By loosening these screws the knives may readily be removed and replaced.

Improved Automatic Shut-off Attachment for Water Closets.

James Cavanagh, New York city.—This is an automatic shut-off attachment for water closets, by which the supply of water is instantly interrupted as soon as the hinged cover of the same is released, and the supply of water regulated as desired; and by the ready access and easy lubrication of the parts, few repairs are rendered necessary. The invention consists of the connection of the stop cock of the supply pipe by a crank lever and adjustable rod with the hinged and weighted cover of the bowl, so that the opening of the same produces the closing of the supply cock, which is provided with a waste pipe and a lubricating pipe attached by a fastening nut to the flange of the bowl.

Improved Knock-Down Bureau and Wash Stand.

William S. Moses, Lebanon, N. H.—The front rails for the support of the drawers are divided in two parts longitudinally, and the front portion is permanently attached to the front of the bureau. The other portion forms part of a removable frame for the support of the drawer. The front sides and back connect by dovetail joints sliding together vertically, and are locked by the top, which slides in the sides, over the back, over and against the front, and is fastened by cams concealed inside. No joints are visible.

Improved Machine for Catching and Destroying Potato Bugs.

Ceylon E. Mathewson and Harvey T. Mills, Franklin Corners, Pa.—The construction is such that, as the machine is drawn forward between two rows of potatoes, the vines will be drawn into the spaces between guards and side bars, where they will be struck by wings. The blows of the wings knock the bugs against a partition, from which they fall upon a bottom, slide down, and pass out through the discharge opening, where they are crushed by rollers.

Improved Oiler.

Henry E. Bohm, Herman Stuhr, and Peter J. Joecken, Cleveland, Ohio.—The bottom plate, top plate, and glass cylinder of the cup are secured by a center bolt, which screws into the cup and also passes through a clamping band and fastens it to the cup.

Improved Saw Mill.

William T. Wayne, Conyngham, Pa.—This invention consists of a vertical guide roller, turning in a sliding standard frame, adjusted by rack, sector pinion, and lever mechanism. The lever is locked by a spring latch to an arc-shaped rack, and adjusted with the sector pinion to the exact position of a horizonal supporting roller by set screws of the supporting hangers.

Improved Hens' Nests.

Julia P. Clement, Williamston, S. C.—A box is divided longitudinally into two equal parts, by a division board extending from the peak of the roof to the floor. The interior is divided up into nest spaces by boards extending up to the roof. The hens, when they enter, pass through an end passage, enter a side passage upon the opposite side from that at which they entered, and take possession of any unoccupied nest. No one can obtain access to the nests in any other way than by opening the hinged parts of the roof.

Improved Hydraulic Press.

John F. Taylor, Charleston, S. C.—This invention relates to certain improvements in cotton presses; and it consists in the combination, with the platen and cross head, of continuous links of tenacious wrought metal, which encompass said platen and cross head lengthwise, and constitute of themselves the frame, and receive all the strain of the press, whereby the construction of the press is greatly simplified and rendered capable of standing a much greater strain than the ordinary cast frames. It also consists of a cushion of woods interposed between the links and the contained platen and cross head.

Improved Sewing Machine Fan Attachment.

Isaac A. Abbot, New Orleans, La.—This invention consists of a standard arranged to fasten on the top of the sewing machine tables and having a rotary fan and a balance wheel mounted on a crank shaft. On the crank of the latter is a long connecting rod extending down to the treadle, with which it is to be detachably connected, so that the fan attachment can be readily put on and taken off at any time, and when on may be worked by the treadle by which the machine is worked.

Improved Potato Digger.

George W. Haag, Milton, Pa., assignor to himself and Pembroke Churchill, same place.—The device includes two sets of teeth, which are pressed into the ground and close under the roots by the forward movement of the machine. Said teeth are mounted on endless chains, traveling on horizontally elongated ways. The teeth are constructed in fluted or grooved transverse section.

Improved Lifting Jack.

John B. Fayette and Lorenzo Meeker, Oswego, N. Y.—A tubular standard contains a movable tube of smaller diameter. A pin passes transversely through the lower part of the tube, and the ends project so as to pass through slots in the standard, so that, by dropping the pin into the proper slots, the tube may be supported at any desired hight. A short rod fits into and slides up and down in the upper part of the tube, and has a head attached to its upper end to receive the object to be raised. To the rod is pivoted a short connecting rod, the lower end of which is pivoted to a lever. By suitable construction, the rod is lowered by raising the free end of the lever, and is raised by lowering the free end of the said lever. In using the jack, the rod is lowered and the tube is adjusted to the proper position in the standard. The jack is then placed beneath the object to be raised, and the free end of the lever is lowered till it passes the perpendicular, which raises the object and locks the jack until the lever is again raised.

Improved Wagon Brake.

George S. Garth and William H. Rosser, Mill Hall, Pa., assignors to George S. Garth, same place.—This invention relates to the means for connecting the lock or brake bar to the hounds, and guiding it as it is moved up to or away from the wheels. Metal plates are bolted to the rear hounds for a lock bar to rest upon. The said plates serve as guides to the said lock bar as it is moved forward and back. To the lock bar is bolted a metal block, which may be made with short slots to receive the bolts, and is made of the thickness of the plates.

Improved Band Saw Guide.

Lewis K. Young and Charles M. Ferguson, Bridgeport, Conn.—This is a guide for band saws, which will be durable and will hold the saw at the desired point. It consists in the use of glass, dovetailed or set in either wood or metal, to form the wearing surface.

Improved Detachable Seat for Chairs.

William W. St. John, Pisgah, Mo.—This is a seat of a chair, stool, or settee, strained and made detachable by means of slats. To keep the two lower slats in position (the two upper slats being kept by the lower), a removable cross bar is applied to one of the slats by a pivot fastening at one end, and a hook at the other end.

Improved Gang Plow.

Henry Opp, Belleville, Ill.—By suitable construction, by loosening nuts, the forward ends of the plow beams may be adjusted at any desired distance apart, and, by loosening a rear bolt, the plow beams may be adjusted to take or leave land, as may be desired. The plow beams are made of different lengths, so that the forward plow may always be out of the way of the furrow slice turned by the following plow. The rear ends of the plow beams may be adjusted to correspond with the adjustment of their forward ends. By operating a lever, the plows may be raised from the ground and lowered to work at any desired depth. A pawl holds the plows to their work and prevents them from running out when plowing hard ground, while a chain prevents them from entering the ground too deep when plowing loose.

Improved Straw Cutter.

Charles F. Stewart and Milton Stewart, Muncie, Ind.—This is an improved straw cutter with reciprocating feed box. It consists of a revolving cutting knife, in combination with a reciprocating feed box, that moves the straw forward by a ratchet wheel and pawl connection of the feed rollers with an actuating lever and cams of the supporting main frame. The upper feed roller turns in bearings of a compressing front gate, and is forced on the straw by springs of suitable power.

Improved Washing Machine.

Jesse Wise and Peter Lane, Elwood, Ind.—This invention include a device which enables the rubbing cylinder to be oscillated to rub any part of the clothes that requires extra rubbing. The operator can hold the clothes with one hand while working the cylinder with the other.

Improved Machine for Attaching Stamps and Sealing Letters.

Eddy Taylor Thomas, Boston, Mass.—A box-shaped casing, about the size of the envelopes mostly in use, is provided at its front part with a letter-opening device, a moistening device, which consists of a middle sponge holder and upper and lower guide plates: the lower for the purpose of passing the gummed flap of the envelope through the same, and moisting the mucilage, and the upper, for moistening the envelope at the place where the stamp is to be affixed. With each stroke of the lever, a stamp is carried to the moistened place of the envelope and attached thereto, while the pressure of the plate seals the flap.

Improved Device for Attaching Hubs to Axles.

Warren E. Pratt, Chesaning, Mich.—The object of this invention is to provide convenient means for fastening the wheels of a vehicle on the axle without the use of screw threads or the ordinary burr or screw nut; and it consists in leaving the ends of the axle or skein square or polygonal, and fastening on the end thereof a washer, to which is attached a key box, having an orifice to fit the axle, the same being fastened to the axle by means of keys and springs.

Improved Steam Rock Drill.

Joseph C. Githens, New York city.—The steam cylinder moves up and down in ways in a shield, which is swiveled to the frame work, and is strengthened by long bolts passing through lugs formed upon its ends. The bolts are extended upward beyond the upper end of the shield, and to their upper ends are attached the ends of a cross bar, to the center of which is swiveled the feed screw, which passes through a screw hole in a lug, formed upon the rear part of the upper end of the cylinder, so that, by turning the said screw, the cylinder may be moved down as the drill works its way into the rock and moved up when the hole has been sunk to the required depth.

Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Notes & Queries

O. K. will find descriptions of wire rope transportation on p. 370, vol. 31.—H. D. will find formulas for calculating the friction of water in pipes on p. 48, vol. 29.—J. D. will find full instructions for making acetic acid on p. 58, vol. 30, p. 75, vol. 31, and p. 106, vol. 32.—J. will find directions for getting rid of flesh worms on p. 233, vol. 31.—H. W. should consult a physician.—C. F. B. will find a recipe for birdlime on p. 347, vol. 28.—G. P. D. will find a recipe for blue black ink on p. 42, vol. 33.—P. E. D. will find a description of a pantagraph on pp. 99, 179, vol. 28.—M. J. W. will find directions for filling walnut wood on p. 315, vol. 30—B. W. will find directions for grinding and polishing glass specula on p. 276, vol. 30.—C. D. A. can mold rubber by the process described on p. 283, vol. 29.—L. G. G. will find a recipe for filling for fireproof safes on p. 75, vol. 32.—A. M. can preserve specimens of fruit by the process described on p. 42, vol. 33.—C. G. C. will find a description of the phosphorus lamp on p. 10, vol. 27.—J. O. R. will find directions for making potato starch on p. 315, vol. 31.—H. T. W. will find a recipe for a cement for glass on p. 379, vol. 31.—G. W. I. will find directions for obtaining sulphur from the ore on p. 295, vol. 31.—J. H. L. will find directions for cementing cellar floors on p. 50, vol. 32.—W. G. O. will find directions for polishing walnut on p. 315, vol. 30.—G. S. can make mica varnish by following the directions on p. 241, vol. 32.—J. E. W. should consult a physician.—N. B. W. should consult the "Text Book of Metals," by Bloxam.—E. A. R. will find a full description of the motion of a crank on p. 112, vol. 31.—J. J. R. can cement leather to rubber by using the preparation described on p. 119, vol. 28.—H. G. M. will find directions for tempering small steel articles on p. 235, vol. 32.—E. B. L. will find a recipe for fine blacking on p. 45, vol. 31. The proper length of a spring can be properly settled by experiment only.—E. J. can clean silver articles by the method described on p. 129. vol. 28.—N. E. B. should consult a physician.—J. L. B. will find full directions for hardening files on p. 212, vol. 26.—J. T. T. will find a recipe for bronzing on brass on p, 283, vol. 31.—C. A. P.G. will find a recipe for pomade on p. 347. vol. 32.

(1) R. B. asks: Can you tell me how to take broken glass stoppers out of bottles? A. Warm the neck of the bottle in a gas flame.

(2) C. H. asks: How can I make bone black suitable for sugar refiners' use? A. In the preparation of bone black, the bones are first boiled in water to remove all the adhering grease (which is otherwise utilized), or, what is perhaps a better method, exhausting them of all grease, etc., by means of bisulphide of carbon. The bones are then thrown into a large retort and subjected to destructive distillation. At first there passes over a large quantity of a fetid gaseous matter, accompanied by a considerable quantity of carbonate of ammonia, and other volatile alkalies, formed on the type of ammonia. These gases and sublimates are passed through a large washer, which retains the ammonia and other salts accompanying the gas; after which the latter is conducted into the furnace and burned beneath the retort. As the distillation proceeds, a quantity of tarry matter and oil comes over. After the operation is finished, the residue remaining in the retort constitutes the animal charcoal. The washing apparatus may consist of a large iron tank, half filled with water, and having a tightly fitting cup through which two pipes pass, one of which—the one leading immediately from the retort—passes down below the surface of the water. The gas, in its passage from the retort, is thus caused to bubble up through the water, and thence it is conveyed by the second pipe into the furnace, where it is burned. The water in the washer may be used several times, or until it becomes nearly saturated with the salts; it should then be drawn off through faucets arranged in the side of the tank, and the salts crystalized out by evaporation, dried, and prepared for market. The tar and oily water remaining in the tank, which are used for the preparation of lamp black, may be drawn off in like manner.

(3) T. B. asks: Is it best to go to college and perfect oneself in architectural science, or enter an office at once, after graduating at an academy? There is a special course of architecture laid out at the college. A. Enter as a student into the office of an architect of large practice, where there is an extensive library of architectural and scientific works.

(4) T. P. asks: What is the cause of the fetid smell of perspiration, and is there any permanent cure for it? A. Do not try to prevent perspiration. It is one of the requirements of a healthy body. Closing up the pores of the skin by the use of certain washes or powders to prevent excessive perspiration is a dangerous experiment. "The perspiratory glands of the skin are scattered everywhere throughout the integument, being most abundant on the anterior portions of the body. They consist each of a slender tube, about $\frac{1}{400}$ of an inch in diameter, lined with glandular epithelium, which penetrates nearly through the entire thickness of the skin, and terminates below in a globular coil, very similar in appearance to that of the ceruminous glands of the ear. These glands are very abundant in some parts. On the posterior portion of the trunk, the cheeks, and the skin of the thigh and leg, there are, according to Krause, about 500 to the square inch: on the anterior part of the trunk, the forehead, the fore arm, and the back of the hand and foot, 1,000 to the square inch: and on the sole of the foot and palm of the hand about 2,700 in the same space. The whole number of perspiratory glands is not less less than 2,300,000, and the length of each tubular coil, when unraveled, about $\frac{1}{15}$ of an inch. The entire length must be not less than 153,000 inches, or about two miles and a half. The fluid derived from this extensive apparatus is the perspiration. It is a clear, colorless, watery liquid, with a distinct acid reaction. Its constitution is as follows: Water 995·00, chloride of sodium 2·23, chloride of potassium 0·24, sulphate of soda and potassa 0·01, salts of organic acids with soda and potassa 2·02. Total, 1,000·00."—*Dalton.*

(5) F. L. B.—The scheme which you suggest for a convention of inventors, to be held during the Centennial year, is theoretically good; but such meetings have been proposed before, and whenever they have been held they have resulted in no practical benefit.

(6) O. W. I. says: I have a galvanic battery of my own construction; and as I do not understand the process of putting it in running order, I ask your advice as to charging the battery. It is composed of two zinc plates and one copper plate, and I want to ascertain the right amount of vitriol to be used. A. Use 1 part oil of vitriol and 15 parts water.

(7) W. N. W. asks: How can muslin be made waterproof without materially changing its color, or injuring its pliability? A. We know of nothing that will satisfactorily answer all your requirements.

(8) S. & C. say: We raised from the grave a few weeks ago the body of a man who had been buried 15 years, in a well cemented metallic coffin; and on removing the iron plate over the glass, we could see on the inside of the coffin (with the corpse) two living common house flies. The body was in a good state of preservation, and there was of course no opening in the coffin to admit the flies. How did they get in? A. We can give no explanation.

(9) O. R. says: It is claimed that a spark will cause gunpowder to explode, but that a flame will not. I claim that, by blowing a flame on it, gunpowder will be exploded. Which is right? A. The action of either a flame or spark upon gunpowder is to cause a slight decomposition of the saltpeter, and at the same time to ignite the combustible carbon and sulphur, which burn at the expense of the oxygen of the saltpeter.

(10) N. & G. ask: Is there such a thing as a magnetic rod, needle, or compass that will be attracted by gold or silver? A. The magnetic properties of these metals yet remain to be discovered. The so-called divining rod has never existed. It is a common way of imposing on the credulous.

(11) J. D. W. asks: 1. Is it true that the friction of a wheel or shaft does not increase with velocity, but only with pressure? A. Yes. 2. In a dynamometer, in which weight and speed are both taken into account to decide, by friction, the power of a machine, if a spring were substituted for the weight, would not an increase of velocity affect the spring more? A. No. 3. Will a spiral spring be contorted or twisted more if it runs at a high than at a low speed? A. Yes. 4. Will a spring of steel or brass, working in steam of ordinary heat, lose its elasticity? A. Yes, in course of time.

(12) Y. E. says: 1. I have built an engine, 1½ by 3 inches, and I want a light and strong boiler for it. Would a piece of 10 or 12 inch boiler flue, say 2 feet long, do to make a plain cylinder boiler of? A. Such a boiler as you speak of might answer, but you would not obtain very good results. 2. How can I make a furnace around it? A. The boiler must be set either in brick or some other suitable material, with the furnace beneath. 3. Would such an engine and boiler be large enough to propel a boat with stern wheel, said boat to be large enough to accommodate 4 or 5 persons? A. You do not give sufficient data. 4. Are ports ⅛x ⅛ inch large enough for a 1½ by 3 engine? A. The ports will answer, but it would be no harm to have them a little larger.

(13) J. G. L. says: I had an anvil of cast iron, 7 inches wide, 12 inches long, and 10 inches high, and tried to put a chilled face on it. The chill was 3½ inches thick, and the face would not harden, remaining as soft as common iron. What was the cause of it? A. It was due to the quality of the iron.

(14) C. T. A. says: 1. If air is taken at atmospheric pressure and at any given temperature, and is compressed to any given pressure per square inch, what would be the resultant temperature? The following formulas are applicable to such cases, provided there is no loss of heat by radiation or conduction: T=absolute temperature of air before compression; t=absolute temperature of air after compression; V=volume of air before compression; v=volume of air after compression; P=pressure of air before compression; p=pressure of air after compression. Then $\frac{t}{T}=\left(\frac{V}{v}\right)^{0·408}=\left(\frac{p}{P}\right)^{0·29}$. This equation can be most readily solved by the use of logarithms, thus: $\log.\left(\frac{t}{T}\right)=0·408\times\log.\left(\frac{V}{v}\right)=0·29\times\log.\left(\frac{p}{P}\right)$ 2. Does the pressure increase as the volume decreases? A. Yes.

(15) H. C. J. asks: 1. Will water coming with force through a large pipe have power to empty a waste water chamber at lower end of small tube placed concentrically with the large one? A. Yes, under certain conditions. That is, the force of the current through the large pipe must be graduated to the length of the small pipe. 2. Would the effect be assisted by making perforations below the nozzle of the small pipe to admit jets of water and force out air or water? A. No, this is unnecessary.

(16) J. L. asks: What is the best work on sawmills? A. There is no work that we know of devoted entirely to sawmill management. Any standard work on millwork will assist you, so that, with practical workmanship, you will be enabled to build any kind of a mill.

(17) J. C. L. says: I wish to color a shingle roof red, so as to resemble red slate. If I paint it, I am assured, the shingles will rot very soon, as the moisture that is drawn up by capillary attraction between the shingles will be prevented from escaping by the paint. Is there any wash, of the proper color and not more expensive than white lead paint, that will not be washed off by rain, and yet will allow the water absorbed by the shingles to dry out? A. Lime wash will preserve the shingles and can be colored any tint you desire by mixing dry color with it.

1. What causes the closet in which I keep woolen blankets to turn black? It is painted with white lead. A. The presence of light is more or less necessary to preserve the purity of white paint. But in your case the discoloration may arise from the escape of gas, either from a gas pipe or an ordinary waste pipe. 2. If I paint the aforesaid closet with white zinc, will the difficulty be remedied? A. It is not likely that it will.

(18) G.W. asks: Is there a substance which will intercept magnetic force when placed between the magnet and armature? A. No.

(19) G.R.McK. says: 1. I wish to face a mill dam, 20 feet high, above and below with rough stone and brick, connecting the two faces with a tube of iron or brick through which the water will pass to the wheel. The abutment of the walls are to be 1 foot thick. How thick should the abutments be at the base to withstand the pressure of the earth between them? A. Six feet. 2. Would lime water answer to lay the stone in, and then plaster the faces exposed to the water with cement? A. No; cement should be used in the wall.

(20) L. W. H. asks: Will a double belt convey more power than a single one, and, if so, in what proportion? A. Yes, other things being equal.

(21) J. S. says: I have a large hollow apple tree which has been filled with large black ants for the last three or four years. How can I get rid of them? A. Try the application to the inside of the tree of a weak solution of chloride of lime. This may be applied expeditiously by means of a large syringe.

(22) E. R. K. says: In a recent issue, you give a formula for calculating the solidity of the frustum of a pyramid. Will the same formula apply to the calculation of earth excavation: in other words, given the two end areas and the perpendicular distance between, will the formula for the frustum of a pyramid give a correct result? If not, what method must be employed? A. It will only answer for special cases. Generally some other rules are employed. You will find them fully explained in any good treatise on the mensuration of earthwork.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. J. H.—Package labelled No. 1 contained a quantity of fine sandstone, a crystal of carbonate of lime, calcite, and a specimen of marcasite or white iron pyrites. They are of little value. Package No. 2 has not been received.—M. J. D.—No. 1 is mica schist in sandstone. No. 2 is principally magnetite. No. 3 is agate imbedded in quartz. No. 4 is quartz. No. 5 is hematite. No. 6 is hornbleade and mica. No. 7 is aragonite. No. 8 is fine white sandstone. No. 9 is sandstone. No. 10 is a variety of light colored shale. No. 11 is dark limestone. No. 12 is decomposed slate. No. 13 is sandstone. The Indian arrowhead is of flint.—S. D. M.—Your communication in regard to formations on specimens of coal sent by you will be answered in full shortly.—J. W. C.—These insects are not described in our works on entomology. We would require more of them for further investigation, as these were few in number and much mutilated.—N. B. W.—No. 1 does not contain silver; it consists chiefly of galena. No. 2 is principally marcasite. No. 3 is baric sulphate. No. 4. The amount of alumina is too large for it to rank with other analyses of kaolin. No. 5 is sulphide of iron.—G. B. McE.—They are of no value. The bright metallic appearance is due to mica.

E. P. says: I have a surveyor's steel chain, the links of which are not soldered or brazed. Can you inform me of the simplest method by which it can be done? C. B. L. asks: How can I color and polish the sections of walnuts to make them look like jet?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Apparitions. By J.
On Hammocks. By J. M. C.
On Steam Cars. By F. G. W.
On Vegetable Sponges. By W. H. C.
On Collegiate Races. By C.
On Mining Cables. By C. T. S.
On the Science of Geometry. By F. G. C.
On Modern Science. By H. B. C.
On Death by Strychnin. By S. J. P.
On the Grasshopper Plague. By G. P. Z.

Also inquiries and answers from the following:

G. P.—N. C. Jr.—N. J. N.—A. E. B.—R. J. T.—B. S. K. O.—W. E. S.—J. R.—L. C. J.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells aneroid barometers? Who sells steel, hard enough to cut glass? Who manufactures the so-called fish guano? Who publishes books on aeronautics?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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Ore stamp feeder, J. Tullock (r)	6,554
Oven for firing pottery, T. M. Minton	165,855
Padlock, H. S. Lockwood	165,741
Paper bag machine, J. Hatfield	165,823
Paper barrel and box, B. Rhodes (r)	6,551
Paper collar machine, C. H. Denison	165,803
Paper stock, grinding, J. M. Burghardtt	165,706
Pavement, wood, J. J. Schroyer	165,882
Pavement, wood, H. M. Stow	165,695
Paving block, Von Versen and Bickel	165,896
Peg cutting machine, J. F. Smith	165,886
Pen and pencil case, J. U. Gerow	165,723
Photometer, O. Schuette	165,764
Pianoforte case, H. J. Baker	165,699
Piano, joiner's, J. Look	165,742
Picture frame, A. D. Judd	165,737
Picture holder, stereoscopic, J. D. Rice	165,870
Pipe stem, H. C. Fritz	165,814
Pipes, forming sockets on, H. B. Camp	165,710
Plane, bench, C. Bridges	165,704
Plane, bench, H. Shogren	165,884
Planter, corn, G. W. Shepherd	165,765
Plow, W. K. Allen	165,652
Plow, J. R. Sample	165,876
Plow, O. P. Sanford	165,877
Plow, G. and T. Wiard	165,903
Plow, gang, E. P. Pulliam	165,866
Plow point, reversible, M. M. Bowers	165,703
Pocket book, C. Arms	165,654
Pocket book safety attachment, T. Potter	165,864
Press, hydraulic, J. F. Taylor	165,891
Printers' leads, cutting, J. A. T. Overend	165,859
Printing plates, numbering, T. Richards	165,871
Printing press, rotary, C. Kahler	165,838
Pulley for shafting, loose, C. H. Mellor	165,852
Pump, double acting, C. Gordon	165,727
Punch, conductor's, Nye and Zapf	165,683
Railway, elevated, J. G. Wilson	165,906
Railway rail chair, R. C. Ludlow	165,845
Railway switch signal, W. W. Colley	165,795
Range, portable, Cox and Hopkin	165,660
Ranges, boiler for, J. A. Gibson	165,724
Refrigerator, ice cream, G. D. Adams	165,651
Refrigerator, show case, J. H. Hoffman	165,733
Register and ventilator, H. N. Creamer	165,797
Register, ventilating, H. Fritz	165,721
Retorts, apparatus for charging, W. Foulis	165,667
Rifles, sharpening, S. P. Doane	165,806
Roller, land, J. A. Keeler	165,839
Roof, metallic, E. Watson	165,771
Rule, registering board, W. M. Bullock	165,659
Sad iron, Harris and O'Neil	165,821
Sandpapering machine, O. Sawyer	165,762
Sash holder, P. Mullane	165,856
Sash holder, O. Rock	165,759
Saw, drag, H. H. Miller	165,749
Sawing machine, hoop, E. Young	165,910
Sawing machine, scroll, J. H. Roberts	165,757
Scraper, rotary road, J. W. Wilson (r)	6,555
Screw driver, W. F. Patterson	165,685
Sewing machine, J. Carter	165,711
Sewing machine, C. S. Cushman	165,798
Sewing machine, A. F. Johnson (r)	6,550
Shafting, loose pulley for, C. H. Mellor	165,852
Sheet iron barrel, C. M. Wyvell	165,909
Shingling gage, C. Schneider	165,880
Sketching and phonographic case, T. J. Phillips	165,686
Slate, school, C. H. Meigs, Jr.	165,747
Spark arrester, J. Dubois	165,662
Spark arrester, Wiser and Schmieders	165,907
Spoke-tenoning machine, W. H. Von Behren	165,895
Stone-cutting, chisel for, C. C. Simpson	165,692
Stove, coal, L. B. Sprout	165,694
Stove pipe joint, G. D. Umland	165,893
Stove polish, J. M. Watson	165,898
Strainer, milk, F. L. Oliver	165,858
Table, ironing, E. S. Heath	165,672
Table, ironing, J. N. Wunderlich	165,908
Telegraph, transmitter for music, E. Gray	165,728
Thermometer, G. Gano	165,816
Ticket stamp, L. J. Blades	165,702
Tile, illuminating, T. Hyatt	165,835
Time check, H. Greene	165,817
Tool, T. Hagerty	165,671
Transit, S. Holton	165,828
Tree protector, R. F. Williams	165,776
Trunks, etc., fastening, J. Hall	165,820
T-squares to boards, attaching, W. B. Stevenson	165,888
Valve gear, reversible, N. E. Nash	165,682
Valve relief, G. H. Clemens	165,791
Vessel for removing foul water, H. H. Vogeding	165,894
Vessels, making of irregular, B. Rhodes (r)	6,652
Vessels, shoal indicator for, Wagner & Rumpus	165,897
Wagon jack, J. Sawyer	165,689
Wagon rack, J. F. Cass	165,789
Washing machine, T. A. Irick	165,675
Washing machine, M. Loughran	165,844
Washing machine, P. Markley	165,679
Washing machine, O. V. Roe	165,874
Watch, M. G. Cole	165,793
Watch escapement, J. R. Hopkins	165,830
Watch, stem-winding, J. D. Brez	165,786
Watches, barrel arbor for, J. R. Hopkins	165,831
Watchmaker's box, P. H. Wheeler	165,774
Watchmaker's eyeglass, M. W. Wiard	165,904
Water meter, W. Helme	165,673
Wells, removing drills from, B. Kent	165,676
Windmill, E. Dewald	165,715
Windmill, R. N. Rockwell	165,873
Wood, preserving, L. S. Robbins	165,758
Wrench, R. S. Battles	165,655
Wrench, pipe, L. Glynn	165,725
Wringer, M. A. Richardson	165,754
Yarn beam, J. A. Gould	165,666
Yarn to set the twist, treating, D. Wright	165,779

DESIGNS PATENTED.

8,488.—DRINKING FOUNTAIN.—J. W. Fiske, N. Y. city.
8,489.—LAMP SHADE.—C. F. A. Hinrichs, Brooklyn, N. Y.
8,490.—GAS BURNER.—M. Stewart, Philadelphia, Pa.
8,491.—KNOB SHANKS.—A. E. Young, Boston, Mass.
8,492.—CENTER PIECE.—H. Berger, New York city.
8,493.—PIPE STEM.—L. G. Hussmann, Guttenberg, N. J.
8,494.—ALBUM LEAVES.—W. Mayer, Brooklyn, N. Y.

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CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,

July 14 to 24, 1875.

4,982.—E. S. Winchester, Boston, Mass., U. S. Rock drill. July 14, 1875.
4,983.—W. Moore, Pelham, Ont. Plow cleaner. July 14, 1875.
4,984.—C. W. Mills, Montclair, N. J., U. S. Self-discharger for grain vessels. July 14, 1875.
4,985.—W. Mathewson, Brooklin, Ont. Oscillating washing and wringing machine. July 15, 1875.
4,986.—R. Dick, Buffalo, N. Y., U. S. Labeling machine. July 15, 1875.
4,987.—C. M. Murch, Cincinnati, Ohio, U. S. Lamp reflector. July 15, 1875.
4,988.—H. Carter, Aylmer, Ont. Carpet stretcher. July 15, 1875.
4,989.—M. C. C. Church, Parkersburgh, Va., U. S. Heating stove. July 15, 1875.
4,990.—W. H. McMillan, Philadelphia, Pa., U. S. Fire plug. July 15, 1875.
4,991.—C. R. Patterson, Pittston, Pa., U. S. Planing machine. July 15, 1875.
4,992.—E. Dallaire, St. Sebastien, P. Q. Auger boring machine. July 15, 1875.
4,993.—J. Matthews, Lyden, Ont. Pump plunger. July 15, 1875.
4,994.—G. Collins, Kingfield, Me., U. S. Saw buck. July 15, 1875.
4,995.—R. Cahuc, Toulouse, Haute Garonne France. Mining powder. July 15, 1875.
4,996.—A. Higley, Cleveland, Ohio, U. S. Car axle box. July 15, 1875.
4,997.—G. P. Farmer, Brooklyn, N. Y., U. S. Yarn bundle. July 15, 1875.
4,998.—J. James, Township Bosanquet, Ont. Bag holder. July 15, 1875.
4,999.—F. Doucet, Yarmouth, N. S. Knife cleaner. July 17, 1875.
5,000.—A. E. Mitchell, Sweetsburgh, P. Q. Churn. July 17, 1875.
5,001.—A. E. Peters, Moncton, N. B. Combination lock. July 17, 1875.
5,002.—R. W. Drew, Albany, N. Y., U. S., *et al.* Automatic lubricator. July 17, 1875.
5,003.—C. L. Holland *et al.*, Ipswich, Mass., U. S. Laundry polish. July 20, 1875.
5,004.—E. Farnsworth, Punxatawney, Pa., U. S. Stump and stone elevator. July 20, 1875.
5,005.—W. H. Seaman, New York city, U. S. Testing the purity of dye in silk. July 20, 1875.
5,006.—H. A. Stearns, Lincoln, R. I., U. S. Churn dasher. July 22, 1875.
5,007.—F. S. Berry *et al.*, New Sharon, Me., U. S. Thill loop. July 22, 1875.
5,008.—G. S. McConkey, Toronto, Ont. Cigar-stamping machine. July 22, 1875.
5,009.—L. Dague, Sherwood, Mich., U. S. Seeder, plaster sower, and harrow. July 22, 1875.
5,010.—P. H. Cowper *et al.*, Montreal, P. Q. Belt-making machine. July 22, 1875.
5,011.—F. L. Pope, Elizabeth, N. J., U. S. Electric signals. July 22, 1875.
5,012.—W. G. Swartz, Fairview, Ill., U. S. Insect-gathering machine. July 24, 1875.
5,013.—W. H. Martin, Mobile, Ala., U. S. Toy gun. July 24, 1875.
5,014.—A. S. Chamberlin *et al.*, Franklin, N. Y., U. S. Stove pipe sheet. July 24, 1875.
5,015.—J. V. Taylor, La Cygne, Kan., U. S. Bed bottom. July 24, 1875.
5,016.—J. Greenebaum, San Francisco, Cal., U. S. Pocket-fastened pants. July 24, 1875.

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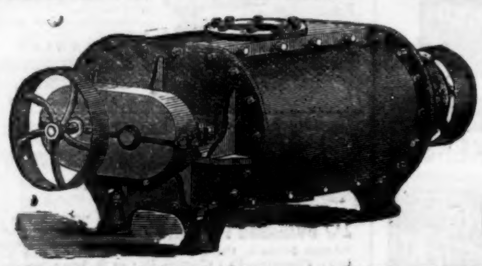

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